May 24, 2013

Auto Alliance Response to House Energy & Commerce Committee Renewable Fuel Standard Assessment White Paper (Greenhouse Gas Emissions and Other Environmental Impacts)

Questions for Stakeholder Comment:

1. **Is the RFS reducing greenhouse gas emissions below that of baseline petroleum-derived fuels? Is the RFS incentivizing the development of a new generation of lower greenhouse gas emitting fuels? Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?**

2. **Could EPA's methodology for calculating lifecycle greenhouse gas emissions be improved, including its treatment of indirect land use changes? If so, how?**

3. **Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?**

4. **What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels? Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?**

5. **Has implementation of the RFS revealed any environmental challenges or benefits not fully anticipated in the statute?**

6. **What is the optimal percentage of ethanol in gasoline? What is the optimal percentage of biomass-based diesel in diesel fuel?**

While the optimal percentage of ethanol in gasoline is dependent on many factors including cost, availability, alternatives, and tradeoffs, the availability of any new fuel should coincide with the availability of the vehicles that can ideally perform on the new fuel, so there is a market for both. Such a prospective approach is a far preferable alternative to EPA's retroactive nature of the E15 waiver for MY 2001 and newer vehicles as those vehicles were not designed, certified or warranted to run on greater than 10% volume ethanol blends.

In order to ensure a successful implementation of a new fuel blend, it is critical that all stakeholders work closely together to determine the right level and to identify and propose government policies to safeguard consumer access to the fuels needed to maintain vehicle performance, reliability, and refueling convenience. It is of great importance that serious consideration be provided to the infrastructure capability across the U.S. as the present infrastructure is limited to providing a maximum ethanol content of 10% with recognition that there are a limited number of stations offering E85. Some key considerations in such a transition include:

Octane Level: Specifically, since ethanol provides less energy on a per gallon basis when compared to gasoline, a simple splash blending approach beyond the 10% ethanol concentration will result in an increased octane rating, assuming no other changes are made to the existing fuel available in the market today. Increasing the octane rating allows auto manufacturers to optimize engine performance to minimize fuel economy decreases inherent with lower energy content ethanol-gasoline blends This change may be crucial for consumer acceptance. It is also critical that automakers not be penalized under future regulations for any decreases in fuel economy that are attributable to renewable fuel use.

Legacy Fuels: Legacy fuels must continue to be available for older vehicles while the refueling infrastructure for higher level ethanol blends is transitioning. Clear signs to auto manufacturers regarding the need to increase renewable fuel capability and flexibility can help to limit the growth of the legacy vehicle fleet. As new vehicles with increased capability become available to consumers the vehicle fleet will eventually turnover to more capable products. Government assistance in implementing an effective program to educate consumers about the fueling capabilities of their vehicles to prevent misfueling in the interim will also be crucial to the success of the effort. In addition, enforcement of fuel blend and labeling requirements must be extensively and effectively executed to assist in consumer compliance.

Stability and Certainty: Any ethanol fuel blend that might be adopted in the future should be defined as a percentage blend limit, rather than a volumetric requirement. In this regard, auto manufacturers can design vehicles capable of handling such fuels, without the threat of creating another “legacy fleet” problem. As currently structured using a volume-based approach, the RFS will present an ever-moving “blend wall” and an unknown target for vehicle design, as the maximum potential blend rate depends on total fuel consumed, something which automakers have no control over.

A prospective approach would give automakers the lead-time required and establish the certainty needed to design and develop vehicles that can best meet the multitude of requirements placed on us by regulators, and by consumers. It should also provide certainty for producers, retailers, engine manufacturers and other stakeholders. With certainty about the fuels our vehicles will be using, our engineers can design vehicles that are optimized for that fuel. This will allow us to deliver better fuel economy, better performance, and more cost-effective compliance with emissions standards – which in turn improves the value proposition for our customers.

In regards to biodiesel, the existing passenger car fleet can operate on diesel containing no greater than five percent biodiesel (B5). However, a number of truck brands are currently able to run on blends greater than B5 and up to B20, so these blends should also be available in the retail marketplace. Automakers support clear pump labels that identify the blends and that encourage customers to check owner manuals to ensure appropriate fuel selection.

7. **What are the best options for substantially further reducing greenhouse gas emissions from the transportation sector? Is the RFS an important component of such efforts?**

Automakers have made significant gains in vehicle fuel economy, and thus the reduction of vehicle greenhouse gas (GHG) emissions. Today nearly 400 models achieve 30 mpg or greater on the highway. Automakers are committed to meeting the aggressive MY 2017-2025 CAFE/GHG emission standards that will require a fleet average of 54.5 mpg by 2025. Over the lifetime of the MY 2017-2025 standards, EPA projects the rulemaking will save approximately 4 billion barrels of oil and 2 billion metric tons of GHG emissions. When the most efficient vehicles replace the existing fleet there will be orders of magnitude savings in GHG emissions. However, even with all the GHG reductions that will occur with the 2017-2025 standards there will still be a gap in reaching the stated goal of 80% reduction GHG emissions by 2050. According to the National Research Council, in addition to improved vehicle fuel efficiency, alternative fuels to petroleum must be readily available, cost-effective and produced with low GHG emissions.[1]

Automakers are spending billions of dollars[2] on compliance with the CAFE/GHG rules and require the cleanest fuels possible to meet these obligations. EPA has repeatedly said that it expects that the majority of greenhouse gas reductions (and corresponding fuel economy increases) will come from advancements in internal combustion engines, and that cleaner fuels are needed to facilitate the technologies necessary to achieve these advancements. Vehicles and fuels are a system and must be integrated to ensure the maximum benefits of today's cleaner and more fuel efficient vehicles are achieved.

[1] National Research Council, 2013, *Transitions to Alternative Vehicles and Fuels*, p. 4.
[2] NHSTA and EPA estimate the MY 2017-2025 fuel economy/GHG emission rulemaking to cost upwards of $157 billion, bringing the combined cost of the MY 2012-25 rules to somewhere between $185 to $209 billion.

The Honorable Fred Upton
Chairman
House Energy and Commerce Committee
Washington, DC 20515

The Honorable Henry Waxman
Ranking Member
House Energy and Commerce Committee
Washington, DC 20515

May 23, 2013

Dear Chairman Upton and Ranking Member Waxman:

We are writing in response to your latest inquiry regarding the Renewable Fuel Standard related to the environment. As mentioned in our previous letters, we encourage you to review your conclusion that "we have a wealth of actual implementation experience with it [the RFS]". We urge you to compare the timing of enactment of the RFS, the compliance schedule in the statute, and the regulatory timeline. A full examination will reveal that to the contrary, we are just one-third of the way through the 15-year policy, and just three years from the issuance of final regulations. In 2007, Congress listened to the frequent requests for policy stability in order to create an environment in which investment decisions can be made. The RFS acknowledges that conditions shift over time, and the statute is filled with multiple flexibility mechanisms that EPA has consistently applied. Legislative interference in a stable policy environment will undercut investment and hamper progress, innovation, and preclude the environmental gains described below.

Today, the U.S. is the top global consumer of oil, using almost 20 million barrels a day. Our nation's continued reliance on oil ensures not only that the U.S. transportation sector will remain greenhouse gas intensive, but also that American families and our economy will continue to be burdened by the high and volatile prices of the global oil market in addition to the national security challenges that come with oil dependence.

EPA reports that the greenhouse gas emissions attributed to transportation accounted for about 31 percent of U.S. CO2 emissions from fossil fuel combustion in 2010, with nearly 65 percent of those emissions stemming from gasoline consumption for personal vehicle use. **We simply cannot address climate change if we do not reduce our consumption of oil regardless of whether that oil comes from inside or outside of our nation's borders.**

And, it is critical that we do so. In early May, concentrations of carbon dioxide reached 400 parts per million, higher than have been present for millions of years. On April 17, 2013, the International Energy Agency (IEA) released its Tracking Clean Energy report, finding that progress adopting clean energy technologies has not met milestones to avoid a 2 degree Celsius rise in global temperatures.

The good news is that a national policy is already in place to steadily reduce our dependence on oil and cut our greenhouse gas emissions. **All Congress needs to do is stay the course.** In 2007, President Bush signed into law the RFS, providing a 15-year roadmap designed to drive investment in renewable fuel and bring new products to market. The regulations implementing the RFS weren't even complete until 2010, and yet renewable fuel has already **displaced petroleum in 10 percent of our gasoline supply**, with 13 billion gallons in 2012. That production supported jobs for, and employed, about 365,000 Americans, while reducing the need for imported oil by more than 462 million barrels. In 2012, the use of renewable fuel **slashed greenhouse gas emissions by 33.4 million metric tons.** That's equivalent to removing 7 million cars and pickups from the road in one year. In 2011, gas prices were reduced by $1.09 per gallon and the average American household saved $1200 on their gas bill thanks to renewable fuel.

The RFS will do even more to reduce oil in our transportation fuel supply and bring increasingly low carbon alternatives to market, so long as it remains in its current form. The RFS sets forth ambitious targets through 2022 for the production of cellulosic and advanced renewable fuel that meet **stringent, specific minimum thresholds of lifecycle greenhouse gas emissions reductions reaching 60 percent,** depending on the type of fuel.

The future growth in the sector lies in the cellulosic and advanced spaces where billions of dollars have been invested in research and development, testing, and commercialization of an entire industry that did not exist in 2007. Today, the industry is putting steel in the ground on multiple commercial facilities led by companies including INEOS Bio in Vero Beach, Florida; KiOR in Columbus, Mississippi; Abengoa in Hugoton, Kansas; POET-DSM in Emmetsburg, Iowa; and DuPont in Nevada, Iowa. The facilities use a diverse group of feedstocks including municipal solid waste, woody biomass, and corn stover, demonstrating that the RFS is driving diversity in feedstock selection.

The critical role of renewable fuel in reducing our oil consumption and transitioning away from these high carbon transportation fuels is well-documented. For example, the April 17, 2013 IEA report called for **more than a doubling of renewable fuel production and a sixfold increase in advanced biofuel capacity by 2020 in order to avoid a 2 degrees Celsius rise in global temperatures.** Destabilization of the policy environment will only reduce the pace of commercialization of lower carbon fuels, making this goal significantly more difficult to achieve.

Renewable fuel is already reducing air pollution; and it will play a critical role in our nation's ability to meet increased fuel efficiency standards. All gasoline is manufactured using a combination of different materials in different blends. One common feature is that all gasoline needs octane to optimize engine performance. Octane is increased with additives to gasoline, most of them substances like benzene, toluene, and xylene. These materials are called "oxygenates," and have been classified by EPA as Hazardous Air Pollutants. These are generally manufactured by the petroleum industry. Octane can also be increased by adding clean, renewable fuel like ethanol, which today, in addition to be being significantly cheaper than other additives saving consumers money at the pump, is cleaner. Studies show that aromatics like benzene, toluene, and xylene impact people living near high traffic areas, freeways, and urban communities. Regardless of the pace of EPA action on aromatics, there are solutions available and in use today. Ethanol increases octane, improving engine performance at lower cost for consumers, while improving the health of our population by cutting exposure to aromatics. If ethanol were not on the market today, the oil industry would instead blend a more expensive, and less environmentally desirable alternative into our gasoline supply, essentially ensuring that consumers pay more to be exposed to hazardous air pollution.

Renewable fuel is already capable of further reducing greenhouse gas emissions; but market access is regularly blocked by high carbon competitors. Today, renewable fuel is blended at a 10 percent blend throughout the country. Higher fuel blends like E15 and E85 are approved for use and vehicles are on the road, waiting for the opportunity to use these products. Yet, consumers do not have a consistent choice to use these fuels due to obstructionist tactics by the oil industry. Reports of the use of branding contracts with station operators to block infrastructure improvements and market opportunity are surfacing, demonstrations of the application of the very type of monopoly power that the RFS was designed to address.

Feedstocks are diversifying, and the current regulatory structure ensures that all are renewable. The first generation portion of the RFS has been met, and the future growth in the sector is in the cellulosic and advanced sectors. The future growth in the sector lies in the cellulosic and advanced spaces where billions of dollars have been invested in research and development, testing, and commercialization of an entire industry that did not exist in 2007. Today, the industry is putting steel in the ground on multiple commercial facilities that use a diverse group of feedstocks including municipal solid waste, woody biomass, corn stover, and sweet sorghum, demonstrating that the RFS is driving diversity in feedstock selection.

While feedstocks are diversifying, agricultural productivity is increasing and farmers are growing more using less land. In 1980, farmers averaged a yield of 91 bushels of corn per acre and produced a crop of 6.6 billion bushels. In 2009, just a generation later, farmers produced an average yield of 164.7 bushels per acre and harvested 13.1 billion bushels. This doubling of the American corn crop was achieved by planting just 3 percent more corn acres in 2009 than was planted in 1980.

Sustainable agriculture initiatives are reducing the environmental impacts of all types of production agriculture. As a baseline, it should be noted that just 13 percent of the nation's corn crop is irrigated. Nearly nine out of every 10 corn acres in the U.S. are rain-fed and require **no irrigation** other than natural rainfall. For those acres that require additional water resources, farmers are using 23 percent less water today than they were in 1988. Additionally, much of the water taken into a corn plant is released back into the air through transpiration. One acre of corn gives off about 4,000 gallons of water per day through evapo-transpiration, according to the U.S. Geological Survey (USGS).

Renewable fuel refining is not resource-intensive. Since 2001, ethanol producers have reduced water requirements by 26 percent. As recently as 1994, more than six gallons of water were required to produce one gallon of ethanol. Indeed, a 2007 National Academy of Sciences report noted, "consumptive use of water is declining as ethanol producers increasingly incorporate water recycling and develop new methods of converting feedstocks to fuels that increase energy yields while reducing water use." Ethanol plants have little or no wastewater discharge, and they recycle a significant portion of their process water through a combination of centrifuges, evaporation, and anaerobic digestion.

The Renewable Fuel Standard ensures that our nation will continue down the path of reducing our dependence on oil, produced at home or abroad, cutting greenhouse gas emissions and breaking the stranglehold that the global oil market has on the price that American families and businesses pay at the pump. It is only with the stability of the RFS that we can continue on our current trajectory to achieve these goals. We cannot afford to go backwards. Efforts by Congress to amend this statute while the program is in its infancy serves only one purpose – providing an opportunity for the oil industry to seek to repeal the statute and protect their monopoly power to restrict choice at the pump for American consumers.

Congressional action will only destabilize the current investment environment, slow the development of renewable fuel, and protect the oil industry from competition, effectively locking in our current greenhouse gas emission profile from the transportation fuel sector for decades to come. We oppose any changes to the RFS and urge you to do the same.

Archer Daniels Midland Company

Biotechnology Industry Organization

May 24, 2013

The Honorable Fred Upton
Chairman
Energy and Commerce Committee
U.S. House of Representatives
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The Honorable Henry A. Waxman
Ranking Member
Energy and Commerce Committee
U.S. House of Representatives
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via email at: rfs@mail.house.gov

Dear Chairman Upton and Ranking Member Waxman:

The Biotechnology Industry Organization (BIO) is pleased to comment on the U.S. House of Representatives Committee on Energy and Commerce's (Committee) third Renewable Fuel Standard (RFS) assessment white paper[1] reviewing the RFS's Greenhouse Gas Emissions and Other Environmental Impacts.

Introduction:

BIO is the world's largest biotechnology organization, with more than 1,100 member companies worldwide. BIO represents leading technology companies in the production of conventional and advanced biofuels and other sustainable solutions to energy and climate change. BIO also represents the leaders in developing new crop technologies for food, feed, fiber, and fuel.

These companies are developing new and innovative ways to help fuel America and the world; providing more environmentally friendly energy crops, cleaner-burning biofuels and renewable chemicals that help reduce greenhouse gas emissions and provide more sustainable sources of energy and materials. These companies are also developing biotechnology crops enabling farmers around the world to produce more abundant harvests on less land with reduced irrigation water, fuel and chemical inputs, and less stress on the

[1] U.S. House of Representatives Energy and Commerce Committee. 9 May 2013. *RENEWABLE FUEL STANDARD ASSSESSMENT WHITE PAPER: Greenhouse Gas Emissions and Other Environmental Impacts* http://energycommerce.house.gov/sites/republicans.energycommerce.house.gov/files/analysis/20130508RFSWhitePaper3.pdf

environment. They also are providing local communities with waste management solutions by converting agricultural and urban wastes into fuels, chemicals and electricity. Given BIO's broad and diverse set of member companies involved in energy, manufacturing and agricultural production, we are able to provide a unique perspective on the issues the Committee is seeking to have answered regarding the Greenhouse Gas Emissions and Other Environmental Impacts of the RFS.

As discussed in our responses to the Committee's first two white papers,[2,3] the RFS has been a success in driving the commercialization of technologies helping to reduce the U.S. transportation system's overwhelming reliance on foreign petroleum. The RFS provides exactly the type of long-term regulatory stability needed to send a signal to investors to develop a domestic biofuels industry that lessens our dependence on foreign fuels and creates jobs in America, using homegrown technology.

Congress established the RFS to encourage the use of existing biofuels and the development of advanced biofuels in order to reduce our reliance on the rising cost and price volatility of foreign oil and reduce greenhouse gas emissions. It is crucial we maintain the RFS in order to spur on alternative energy production and mitigate environmental impacts of petroleum. In fact the RFS is one of the rare cases of an existing and functioning greenhouse gas reduction program. A repeal or reduction in the RFS would be tantamount to environmental backsliding.

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[2] Biotechnology Industry Organization. 5 Apr. 2013. *BIO Comments on U.S. House of Representatives Committee on Energy and commerce's White Paper Reviewing the Renewable Fuel Standard (RFS)*. http://www.bio.org/advocacy/letters/bio-comments-us-house-representatives-committee-energy-and-commerces-white-paper-re

[3] Biotechnology Industry Organization. 29 Apr. 2013. BIO Comments on U.S. House of Representatives Committee on Energy and Commerce's White Paper Reviewing the Renewable Fuel Standard's (RFS) Agricultural Sector Impacts. http://www.bio.org/advocacy/letters/bio-comments-us-house-representatives-committee-energy-and-commerces-white-paper--0

White Paper Response:

The Committee has again requested comments on a list of questions in this white paper. In order to properly address each question, this paper has each question italicized and listed below. BIO's response will directly follow each question.

Energy and Commerce Committee, RENEWABLE FUEL STANDARD ASSESSMENT WHITE PAPER, Greenhouse Gas Emissions and Other Environmental Impacts, Questions for Stakeholder Comment

1. ***Is the RFS reducing greenhouse gas emissions below that of baseline petroleum-derived fuels? Is the RFS incentivizing the development of a new generation of lower greenhouse gas emitting fuels? Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?***

While fueling the world, biotechnology is also helping to feed the world, providing more environmentally friendly energy crops, cleaner burning biofuels and renewable chemicals that help reduce greenhouse gas emissions and provide more sustainable sources of energy and materials. The companies BIO represents are developing innovative biobased fuels, products, and processes that will enable our economy to achieve these objectives. Among the technologies being developed commercially by BIO members are:

- Low carbon conventional and advanced biofuels;
- Crop varieties that improve land use efficiency and enhance soil sequestration of CO_2;
- Renewable chemicals with dramatically reduced carbon footprints relative to their petroleum-derived counterparts;
- Biotech manufacturing processes that sharply reduce energy use in industrial production and consumer applications; and
- Algae scrubbers to capture CO_2 from smokestacks and increase natural sequestration of carbon dioxide from the atmosphere.

Multiple independent analyses document the tremendous GHG reduction potential of biotechnology.[4,5,6,7,8,9]

[4] WWF, "Industrial Biotechnology, More Than a Green Fuel in a Dirty Economy?" http://www.bio-economy.net/reports/files/wwf_biotech.pdf, 2009.
[5] The European Association for Bioindustries ("EuropaBio"), "How Industrial Biotechnology Can Tackle Climate Change" http://www.europabio.org/sites /default/files/facts/how_industrial_biotechnology_can_tackle_climate_change.pdf, 2008.
[6] German Advisory Council on the Environment, "Climate Change Mitigation by Biomass" http://eeac.hscglab.nl/files/D-SRU_ClimateChangeBiomass _Jul07.pdf, 2007.
[7] Biotechnology Industry Organization ("BIO"), "New Biotech Tools for a Cleaner Environment", http://www.bio.org/sites/default/files/CleanerReport.pdf, 2004.
[8] Brookes, G. and P. Barfoot (2013). "The global income and production effects of genetically modified (GM) crops 1996–2011." GM Crops and Food: Biotechnology in Agriculture and the Food Chain **4**(1): 74-83.
[9] Brookes, G. and P. Barfoot (2013). "Key environmental impacts of global genetically modified (GM) crop use 1996–2011." GM Crops and Food: Biotechnology in Agriculture and the Food Chain **4**(2): 0-10.

In addition to directly reducing GHG emissions, biotechnology can help farmers and biofuel producers reduce carbon emissions by: reducing petroleum and fertilizer inputs in agriculture; increasing yields from existing crop land; enabling sequestration of additional carbon in the soil; diverting organic waste from landfills; and increasing yields of product per ton of raw material.

The RFS represents the nation's only Congressionally authorized greenhouse gas reduction program. Production of biofuels under the RFS is subject to strict lifecycle GHG reduction requirements of up to 60 percent compared to traditional petroleum-derived fuel. As a result, in 2012, using renewable fuel slashed greenhouse gas emissions by 33.4 million metric tons.[10] EPA has estimated that renewable fuels use under the RFS will reduce greenhouse gas emissions by 138 million metric tons when the program is fully implemented in 2022. [11] The reductions would be equivalent to taking about 27 million vehicles off the road.

In practice, greenhouse gas reductions under the RFS are likely to be even more significant. The greenhouse gas emissions of conventional fuel in 2012 were lower than that predicted by the EPA for 2022.[12] In addition, many cellulosic and other advanced biofuel pathways approved by EPA already substantially exceed the minimum GHG reductions required by the law. For example the INEOS Bio process, which is being commercialized at a new biorefinery in Vero Beach, Florida, reduces greenhouse gas emissions up to 91% when running residual municipal solid waste as a feedstock. When the process utilizes food and yard waste, the process results in GHG emissions savings of 109%--a net carbon savings. This is because the process also generates electricity that would otherwise come from fossil energy and because the wastes would emit methane if otherwise landfilled. Future feedstock and conversion technology improvements will drive GHG reductions even further, with many pathways likely to be net carbon sinks representing greater than 100 percent reductions relative to the petroleum baseline.

In contrast, lifecycle GHG emissions for petroleum are increasing with time. "Well-to-Wheel GHG emissions" of gasoline produced from Canadian tar sands, for example, emit 14% to 20% more GHGs than the weighted average of transportation fuels sold or distributed domestically. Excluding the final use combustion, "Well-to-Tank" GHG emissions of oil sands crudes are on average 70%-110% higher than for the average domestic transportation fuel.[13] And crude oil from Canada has grown to a proportionally larger percentage of the U.S. transportation fuel mix since 2005 – the EPA baseline year. The United States is the destination for 99 percent of Canada's oil. About half of Canada's exports come from oil sands, and since 98 percent of Canada's reserves are in oil sands, that percentage is

[10] Renewable Fuels Association, "Battling for the Barrel: 2013 Ethanol Industry Outlook." Washington, DC: February 2013, p.18.
[11] US EPA, "Renewable Fuel Standard Program (RFS2) Regulatory Impact Analysis." Washington, DC: EPA-420-R-10-006, February 2010.
[12]Steffen Mueller, John Kwik. New Report: 2012 Corn Ethanol - Emerging Plant Energy and Environmental Technologies, http://www.erc.uic.edu/PDF/mueller/2012_corn_ethanol_draft4_10_2013.pdf
[13] Lattanzio, R. "Canadian Oil Sands: Life-Cycle Assessments of Greenhouse Gas Emissions (7-5700/R42537)." Washington: Congressional Research Service, March 15, 2013. http://www.fas.org/sgp/crs/misc/R42537.pdf

expected to increase.[14] While U.S. oil imports overall have fallen, U.S. imports of Canadian oil have increased.[15]

The RFS is the single most important federal policy driving investment and commercialization of conventional and advanced biofuels. Biofuel production under the RFS has already displaced nearly 10 percent of U.S. gasoline consumption and will account for more than 20 percent of U.S. transportation fuel use by 2022. Facilities like INEOS Bio's in Vero Beach, Florida, and KiOR's in Columbus, Mississippi, representing several hundred million dollars of investment in the United States, are poised to begin production of the next generation of renewable fuel from wood and other waste in 2013. Dozens more advanced biofuel projects are planned or under construction. Appendix I illustrates the visible progress in advanced biofuel production under the RFS.

The RFS provides exactly the type of long-term, regulatory stability that is required to send a signal to investors. The single most important thing Congress can do to reduce our nation's dependence on oil and cut greenhouse gas emissions is to leave the RFS in place, as-is. We are just 1/3 of the way through the timeline Congress laid out in 2007 and just three years removed from implementation of RFS2 in 2010. Given the incredible strides the industry has made in such short time period we must stay the course or risk losing the progress we've made.

2. ***Could EPA's methodology for calculating lifecycle greenhouse gas emissions be improved, including its treatment of indirect land use changes? If so, how?***

Consideration of lifecycle greenhouse gas (GHG) emissions is an important component of identifying truly sustainable transportation fuel solutions. BIO recognizes the importance of comprehensive accounting of greenhouse gas emissions, and appreciates the thoughtful, open, science-based approach EPA has taken to determining lifecycle GHG emissions under the RFS program. BIO believes the methodology developed by EPA in its initial rulemaking reasonably incorporated the best science and data available at the time. However, BIO remains skeptical that the indirect impacts assumed under EPA's methodology are real or significant. A significant body of new work has emerged since EPA developed its methodology, casting doubt on the existence or magnitude of indirect land use change impacts. [16,17,18,19,20,21] EPA should perform periodic review of its methodology and incorporate the latest as new information becomes available.

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[14] U.S. Energy Information Administration, Country Analysis: Canada. http://www.eia.gov/countries/cab.cfm?fips=CA

[15] U.S. Energy Information Administration, "Canada Week: Canada is the leading supplier of crude oil to the United States." Today in Energy, November 28, 2012. http://www.eia.gov/todayinenergy/detail.cfm?id=8950

[16] Kim, Hyungtae, Kim, Seungdo, Dale, Bruce E., *Biofuels, Land use Change and Greenhouse Gas Emissions: Some Unexplored Variables*

[17] Marshall, E. et al. "Measuring the Indirect Land-Use Change Associated With Increased Biofuel Feedstock Production: A Review of Modeling Efforts. (Report to Congress)" Washington: Economic Research Service, February 2011.

[18] Wicke, B., P. Verweij, et al. (2012). "Indirect land use change: review of existing models and strategies for mitigation." Biofuels 3(1): 87-100.

[19] Oladosu, G., K. Kline, et al. (2012). "Global economic effects of US biofuel policy and the potential contribution from advanced biofuels." Biofuels 3(6): 703-723.

In addition to the indirect models detailed above, significant updates and improvements have been made to the GREET model, used to calculate direct emissions for biofuels since 2008. These changes are documented in thirty eight publications from Argonne National Lab.[22] EPA should also consider updating its assessment of direct emissions to include the latest data and information.

BIO further believes that EPA should revisit the baseline gasoline and diesel emissions values originally developed for the program. As previously referenced, lifecycle GHG emissions for petroleum continue to increase as unconventional, high-carbon sources such as Canadian tar sands become a larger part of the U.S. transportation fuel mix. Reductions in lifecycle GHG emissions for biofuels should be evaluated against emissions from petroleum that would otherwise have been combusted in the absence of biofuels – namely, high-carbon marginal petroleum sources.

In its wisdom, Congress afforded EPA the flexibility to make these and other methodological adjustments in the program's annual rulemaking. While BIO may not agree in full with EPA lifecycle GHG methodology, it fully supports EPA's approach and authority. No action is required, nor should it be pursued, by Congress on this matter.

3. ***Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?***

The EPA definition of renewable biomass is one of the narrowest in federal law and has abundant environmental protections. For example, the RFS definition of renewable biomass prohibits use of lands cleared or cultivated subsequent to the date of the law's enactment and excludes tree crops, tree residues, and other biomass materials obtained from federal lands.[23] The definition also restricts woody biomass from private lands, prohibiting the collection from sensitive ecological communities, old growth forests and late successional forests, and limiting other wood collection to slash and pre-commercial thinning.

BIO believes the chief environmental risk in the RFS definition of renewable biomass is in its exclusions. Woody biomass exclusions preclude use of biomass from environmentally beneficial activities such as fire suppression and maintenance activity on federal lands, and exclude diseased or otherwise unmerchantable trees and other byproducts of a commercial logging operation on private land. Woody residues from saw mills and paper mills can meet the definition of renewable biomass only if they are from planted trees from actively managed tree plantations on non-federal land cleared prior to the law's enactment on December 19, 2007, ignoring the commercial reality of managed forests in the Pacific Northwest and parts of New England where a combination of natural regeneration and seeding is practiced.

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[20] Taheripour, F. and W. E. Tyner (2013). "Induced Land Use Emissions due to First and Second Generation Biofuels and Uncertainty in Land Use Emission Factors." Economics Research International 2013: 12.
[21] Farzad Taheripour and Wallace E. Tyner (2013). "Biofuels and Land Use Change: Applying Recent Evidence to Model Estimates." Applied Sciences 2013 (3): 14-38.
[22] http://greet.es.anl.gov/index.php?content=publications&by=date&order=down#GREET_Model_Reports
[23] http://www.gpo.gov/fdsys/pkg/BILLS-110hr6enr/pdf/BILLS-110hr6enr.pdf Energy Independence and Security Act of 2007

Non-federal lands, such as private forests, provide significant environmental benefits that are at risk of being lost. Private forest owners are facing increasing pressure to convert their land to other uses as they cannot be assured of viable markets for forest products. The pressure is a result of the narrow definition of renewable biomass which prevents millions of acres of private forests that could otherwise serve as a source for renewable fuels. By excluding private forests, you risk losing the nation's largest carbon sink, as well as watershed protection, wildlife habitat, carbon dioxide absorption, and other ecosystem services.

The restriction of wastes to "separated yard waste or food waste" is another example whereby the RFS limits one of the most promising and environmentally beneficial feedstock sources while also complicating and increasing the cost of utilizing municipal solid waste.

With respect to the impact of RFS feedstock production on native and sensitive lands, concerns are simply unfounded. For example, in a widely circulated recent paper, Wright and Wimberly state that corn and soybean production is expanding onto marginal lands – specifically grasslands and the Prairie Pothole Region – as a result of biofuel production under the RFS. [24] But, as noted previously in this paper, the Energy Independence and Security Act of 2007 (EISA) excludes agricultural land cleared or cultivated after December 19, 2007. Furthermore, an in-depth analysis conducted by the U.S. Department of Agriculture (USDA) found that total crop acres in the study's five-state region (IA, MN, NE, ND, SD) actually *declined 2.1%* from 2006 to 2011, while U.S. forest and grassland increased dramatically during a period when ethanol production more than tripled. This followed a period from 2002 to 2007 when total cropland *decreased* by 34 million acres to the lowest level since USDA began collecting this data in 1945.[25] Data from the USDA shows that the increase in corn and soybean acres in the five-state region was primarily achieved via crop switching, rather than cropland expansion.[26] That is, farmers increased corn/soybean plantings on land previously planted to hay, wheat, and other crops.

Despite the highly restrictive RFS definition of renewable biomass, pioneering industrial biotechnology leaders are helping to make advanced and cellulosic biofuels a reality, working within the limited confines of the definition. As stated elsewhere in this paper, near-term growth of this nascent industry is critically dependent on the stable, long-term market opportunity afforded by the RFS. No legislative changes to the RFS should be implemented until these technologies are well demonstrated and established, with robust flow of private capital into advanced and cellulosic biofuel projects. At that time, Congress should consider re-evaluating EISA's renewable biomass restrictions to achieve the maximum environmental, economic and national security benefits of the RFS.

4. ***What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels? Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?***

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[24] Christopher K. Wright and Michael C. Wimberly. Biological Sciences - Sustainability Science: Recent land use change in the Western Corn Belt threatens grasslands and wetlands *PNAS 2013 110 (10) 4134-4139;* www.pnas.org/cgi/content/short/1215404110

[25] http://www.ers.usda.gov/media/177328/eib89_reportsummary.pdf

[26] http://www.ethanolrfa.org/exchange/entry/response-to-recent-land-use-change-in-the-western-corn-belt-threatens/

The substitution of biofuels for petroleum-derived fuels provides a host of environmental benefits beyond the GHG reductions enumerated above. A 2011 review by the National Academy of Sciences identifies potential environmental benefits from biofuel substitution across a range of metrics, including air quality, water quality, water use and biodiversity.[27]

For example, modern biorefineries go to great lengths to conserve water. While ethanol production traditionally required an amount of water that is roughly equivalent to gasoline production, many biorefineries are now on track to use only 2.33 gallons of water per gallon of ethanol by 2015.[28] At the same time, the feedstocks for biofuel production are becoming more water efficient. Crops improved by agricultural biotechnology are being grown in 28 countries by more than 17 million farmers, across 421 million acres. The vast majority of these crops have traits that make them more resistant to destructive pests and diseases, and more resistant to drought. This enables farmers to use less fertilizer, fuel, and water. Next generation purpose-grown energy crops, such as perennial grasses and short-rotation woody crops, offer further potential for reduced reliance on water and fertilizer and can be grown on land not suitable for many food crops. For example, most algae being developed for biofuel production are able to grow in arid climates with brackish water or sea water.[29] Conversely, 44 gallons of water are required per gallon of oil.

Biofuels also provide well-documented air quality benefits, including reduced emissions of sulfur and a range of criteria pollutants.[30, 31]

Another benefit of biofuels is that they create a cleaner fuel. Biofuels allow for the use of less detergent additives, which are required by the EPA to reduce the formation of engine deposits that occur from gasoline components. These deposits increase exhaust emissions and result in the loss of fuel economy and performance. The benefits of cleaner fuel would only increase with higher biofuel blends, since only the gasoline portion needs to be treated with the deposit control additives.

It is also important that RFS environmental impacts be measured against a status quo of total dependence on petroleum for liquid transportation fuel.[32] In the absence of the roughly 10 percent of domestic transportation fuel now derived from biofuels, an additional 13 billion gallons of petroleum-derived gasoline and diesel would be required every year. This increased consumption of petroleum would be accompanied by increased impacts from oil exploration, transport and refining, including heightened risk of oil spills and a variety of environmental concerns with marginal oil extraction. Recent pipeline accidents in the Kalamazoo River in Michigan[33] and in Mayflower, Arkansas[34] have illustrated the increased environmental impacts and difficulty of cleaning up oil from marginal sources.

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[27] "Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy" The National Academies. 2011
[28] Kenny, J.F., Barber, N.L., Hutson, S.S., Linsey, K.S., Lovelace, J.K., and Maupin, M.A., 2009, Estimated use of water in the United States in 2005: U.S. Geological Survey Circular 1344, 52 p.
[29] Stevens, Brad. "Biofuels Sustainability: A Nonfood Feedstock Primer," BIOMASS MAGAZINE. http://biomassmagazine.com/articles/2411/biofuels-sustainability-a-nonfood-feedstock-primer
[30] http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf
[31] http://www.ethanolrfa.org/page/-/objects/documents/69/nec_whitten.pdf?nocdn=1
[32] Parish, E., K. Kline, et al. (2013). "Comparing Scales of Environmental Effects from Gasoline and Ethanol Production." Environmental Management **51**(2): 307-338.
[33] Lisa Song, "A Dilbit Primer: How It's Different from Conventional Oil." InsideClimate News, Jun 26, 2012.

What is clear is that while agriculture and biorefining continue to make environmental improvements, traditional oil production is getting worse.

5. ***Has implementation of the RFS revealed any environmental challenges or benefits not fully anticipated in the statute?***

While clearly forward-looking as a policy, the RFS could not possibly anticipate all of the innovation that would occur as a result of its implementation. Biofuels production spurred by the RFS is already proving a powerful component of highly promising environmental mitigation projects throughout the nation.

In North Carolina, pork producers are planting Coastal bermudagrass on swine sprayfield lands and harvesting the grass for cellulosic biofuel production. Coastal bermudagrass has been shown is the most favorable crop for assimilating nitrogen. As a result, Coastal bermudagrass is now being used for uptake of excess nutrients (which would otherwise pose environmental risk to surround waterways) and as a biomass feedstock, creating multiple environmental benefits.

Innovations and environmental benefits have also occurred at the Green Plains Renewable Energy facility in Iowa. Green plains has partnered with BioProcess Algae, who produces algae with commercial scale bioreactors on site. The algae grown and harvested from the bioreactors can be utilized for advanced bio-fuel production. An environmental benefit from the co-location is the ability to use the carbon dioxide that is a by-product from the Green Plains Renewable Energy ethanol production.

Algae biofuel production can also be integrated into municipal wastewater treatment, providing a dual benefit of improved water quality while generating alternatives to petroleum. One DOE-funded grant supports the work of the Algae Technology Group (ATG) in California to develop efficient recycling of water and nutrients in algal biofuels production.[35] The ultimate goal of the project is to commercialize the use of algae in the wastewater recycling process and production of biofuels.

Purpose-grown energy crops, such as annual and perennial grasses, short-rotation woody crops, and algae, offer particularly promising environmental benefits. Some critics have expressed concerns that certain purpose-grown energy crops, including algae, may pose a risk of invasiveness. However, a well-developed regulatory structure exists for potentially invasive plants and algae, as well as for biotech-enhanced agriculture. Additionally, the U.S. Department of Energy (DOE) is undertaking an EIS on purpose grown energy crops to help ensure these crops provide the maximum environmental benefit. In the case of algae, the report "Sustainable Development of Algal Biofuels in the United States" by the National Research Council, has found that sustainability concerns, including invasiveness, are not a barrier to development of algae biofuels, since mitigation strategies are being developed.[36]

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[34] Edward McAllister, "Insight: Mayflower, meet Exxon: When oil spilled in an Arkansas town." Reuters, Apr 11, 2013

[35] http://ceenve.calpoly.edu/newsletters/ceenv-e-news-winter-2013/dr-tryg-lundquist-leads-cal-poly-algae-biofuels-pr/

[36] "Sustainable Development of Algal Biofuels in the United States" National Research Council. 2012. http://www.nap.edu/catalog.php?record_id=13437

6. *What is the optimal percentage of ethanol in gasoline? What is the optimal percentage of biomass-based diesel in diesel fuel?*

The nation's environmental, economic and national security interests demand that we pursue widespread adoption of biofuels at the highest achievable levels in all fuel pools. Biofuels are clean, renewable, and homegrown.

Drop-in replacement biofuels have the same properties and composition as petroleum-based fuels and may be used in existing infrastructure. Because of these factors, existing downstream petroleum infrastructure and engines can run on these fuels without blend restrictions. These fuels should be blended at the highest rates achievable given market conditions. The primary challenge for drop-in biofuels is scale, but this can be overcome with greater investment in this technology, which is being drive by the RFS.

High octane biofuels, such as ethanol, and high octane renewable gasoline, complement drop-in alternatives by offering a pathway to meet the higher mileage CAFÉ standards in the 2012 rulemaking "2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards."[37] High octane ethanol and high octane renewable gasoline can be operated at substantially higher compression ratios than standard gasoline, allowing for smaller, lighter, and more efficient engines. Additionally, in its Tier III rulemaking, EPA acknowledged that higher octane fuels "could help manufacturers that wish to raise compression ratios to improve vehicle efficiency, as a step toward complying with the 2017 and later light-duty greenhouse gas and CAFE standards. This in turn could help provide a market incentive to increase ethanol use beyond E10 by overcoming the disincentive of lower fuel economy associated with increasing ethanol concentrations in fuel, and enhance the environmental performance of ethanol as a transportation fuel by using it to enable more fuel efficient engines."[38]

7. *What are the best options for substantially further reducing greenhouse gas emissions from the transportation sector? Is the RFS an important component of such efforts?*

BIO firmly believes that by continually providing market access for biofuels, greenhouse gas emissions from the transportation sector will continue to decline. While incumbent industries currently control the market, sustained and consistent implementation of the RFS will encourage the development of infrastructure, which can readily grow the supply of biofuels in the market.

Multiple avenues exist for blending additional volumes of biofuels into the nation's fuel supply. E15 blends are approved and ready for use, and production of flex fuel vehicles ("FFVs") should continue to increase, enabling consumers' freedom of choice for their fuel needs. These options, combined with the introduction of new "drop-in" fuel molecules, provide multiple opportunities to reduce greenhouse gas emissions. This will help drive the

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[37] 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule, 77 Fed. Reg. 62623–63200 (October 15, 2012).
[38] Environmental Protection Agency, "Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards," EPA–HQ–OAR–2011–0135 (prepublication version) March 29, 2013, page 24.

market and encourage retailers to adopt new infrastructure, while providing consumers the opportunity to choose their fuel based on environmental and economic benefits.

The RFS is vital to continued growth of biofuel markets. Other steps by EPA, such as adoption of a higher-octane blend as the gasoline base fuel, and expedited approval of new drop-in fuel molecules, can further accelerate deployment. Reconsideration of the gasoline base fuel would enable engine manufacturers to optimize beneficial characteristics of biofuels in engine design, while expedited approval of new pathways would provide obligated parties with additional options for compliance not subject to blending limitations.[39] Rapid approval of alcohol-to-jet fuel pathways, for example, would create additional markets for biofuels not subject to arbitrary blending limits.[40]

Additional complimentary federal policies also play a key role in achieving the full environmental benefits of the RFS. Advanced biofuel tax incentives, such as the second-generation biofuel producer tax credit and accelerated depreciation for advanced biofuel plant property, help ease access to capital to build first-of-a-kind advanced biorefineries. The Farm Bill's Title IX energy programs are also helping to ease access to capital while accelerating adoption of environmentally beneficial purpose-grown energy crops and encouraging development of renewable chemicals and biobased products that help improve biorefinery economics.

Conclusion:

The federal Renewable Fuel Standard is one of the most important environmental policies implemented by Congress in the past two decades. While primarily an economic and energy security policy, the RFS has already resulted in dramatic reductions in GHG emissions and other environmental benefits from the transportation fuel sector, and offers the potential for substantial additional benefits in the decades to come. Realization of these future benefits is dependent on the ability of advanced biofuel developers to raise the capital necessary to build out a national advanced biofuel industry. That ability is critically dependent on the legislative stability and consistent implementation of the program. The best thing Congress can do to achieve these future benefits is to resist oil industry pressure to revise the program in their favor and allow the RFS to work. We thank you for the opportunity to respond on this important matter.

[39] http://www.afdc.energy.gov/fuels/emerging_dropin_biofuels.html
[40] http://www.safug.org/case-studies/

Appendices

I. BIO, *The Renewable Fuel Standard: Timeline of a Successful Policy* (2012)

The Renewable Fuel Standard

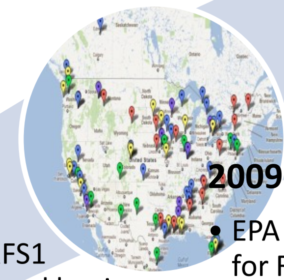
Timeline of a Successful Policy

Biotechnology Industry Organization (BIO)

2005

- Energy Policy Act of 2005 becomes law, enacting RFS1.
- Ethanol production is 3.9 billion gallons, biodiesel 112 million gallons.

2007



- EPA final-izes RFS1 rules and begins program, offering compliance through Renewable Identification Numbers (RINs).
- The Energy Independence and Security Act of 2007 becomes law, enacting RFS2.
- **Verenium (BP Biofuels)** breaks ground on 1.4 million gallon cellulosic biofuel demonstration.

2009

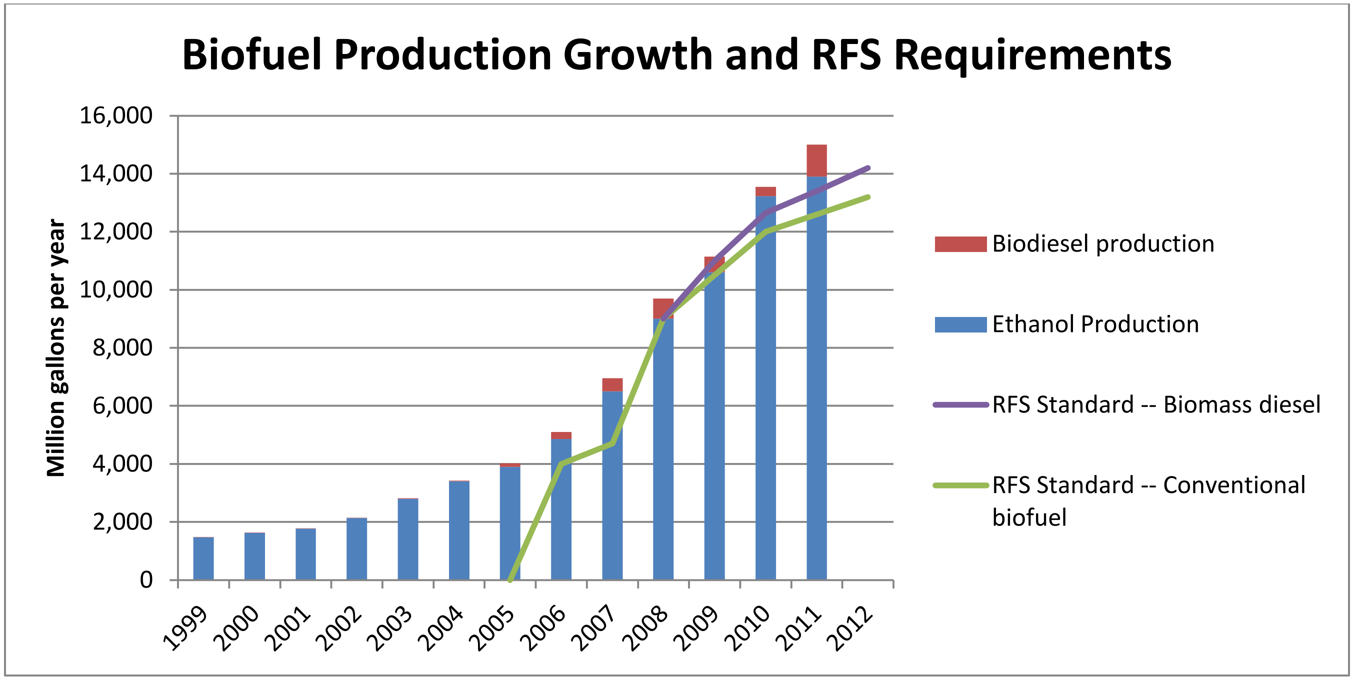
- EPA proposes rules for RFS2.
- More than **30 cellulosic and algae biofuel** pilot and demonstration biorefineries are operating or in planning stages, including Coskata and DuPont Cellulosic Biofuels.
- More than 12 companies in the United States and Canada have planned commercial biorefineries.

2010 - 2011

- EPA publishes final rules for RFS2, which takes effect in July.
- Companies break ground on commercial-scale cellulosic biorefineries, including **Abengoa**, DuPont Cellulosic Biofuels, INEOS BIO, KiOR and POET-DSM. Projected completion and start up of biorefineries ranges from 2012 to 2014.

2012

- INEOS Bio and KiOR complete construction and register their facilities to generate qualifying fuel for RINs.
- Blue Sugars in Upton, Wyo., and KiOR in Pasadena, Texas generate a combined 21,810 gallons of cellulosic fuel and RINs.



Biofuel Production Growth and RFS Requirements
Million gallons per year
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
Biodiesel production
Ethanol Production
RFS Standard -- Biomass diesel
RFS Standard -- Conventional biofuel

Abengoa Bioenergy, Hugoton, Kans.

26.5 million gallons per year, cellulosic ethanol.

Start Date: 4Q 2013.

Figure 1: Abengoa Bioenergy biorefinery project stack yard.

Figure 2: Abengoa Bioenergy biorefinery construction progress, Feb. 2012.

BP Biofuels, Jennings, La.

1.4 million gallon per year cellulosic biofuel demonstration biorefinery.

Start Date: 1Q 2007.

Figure 3: BP Biofuels demonstration facility and feedstock processing, in operation since 2007.

DuPont Cellulosic Biofuels, Vonore, Tenn.

250,000 gallon per year cellulosic biofuel demonstration biorefinery.

Start Date: 4Q 2009

Figure 4: DuPont Cellulosic Biofuel biorefinery in Vonore, Tenn.

DuPont Cellulosic Biofuels, Nevada, Iowa.

30 million gallon per year cellulosic biofuel commercial biorefinery.

Start Date: 3Q 2014

Figure 5: Flag-raising ceremony during DuPont Cellulosic Biofuel biorefinery groundbreaking in Nevada, Iowa, November 2012.

Figure 6: Lt. Gov. Kim Reynolds (R-Iowa), Gov. Terry Branstad (R-Iowa) and DuPont Industrial Biosciences President Jim Collins

Fiberight, Blairstown, Iowa

6 million gallon per year cellulosic ethanol.

Start Date: 2Q 2013.

Figure 7: Fiberight biorefinery undergoing renovation to cellulosic ethanol.

Gevo, Luverne, Minn.

22 million gallon per year biobutanol.

Start Date: 2Q 2012.

Figure 8: Gevo biorefinery retrofitted for biobutanol production and opened May 2012.

INEOS New Planet BioEnergy, Vero Beach, Fla.

8 million gallon per year cellulosic ethanol; 6 MW biomass electricity.

Start Date: 4Q 2012.

Figure 9: INEOS New Planet BioEnergy August 2012. Facility is currently in commissioning and producing renewable electric energy.

Figure 10: USDA Sec. Tom Vilsack checks construction progress, August 2011.

Novozymes, Blair, Neb.

Commercial enzyme biorefinery.

Start Date: May 2012

Figure 11: Novozymes North America enzyme biorefinery at opening in May 2012.

POET-DSM Advanced Biofuels, Emmetsburg, Iowa

25 million gallons per year cellulosic ethanol.

Start Date: 3Q 2013.

Figure 12: POET-DSM Liberty Project construction progress, February 2013.

Figure 13: POET-DSM corn stover stack yard November 2011.

Sapphire Energy, Columbus, N.M.

1 million gallon per year integrated algal biorefinery.

Start Date: 1Q 2014

Figure 14: Sapphire IABR construction progress November 2011.

Figure 15: Sapphire IABR ground preparation October 2011.

ZeaChem, Boardman, Ore.

250,000 gallon per year acetic acid, ethyl acetate and cellulosic ethanol.

Start Date: 2012.

Figure 16: ZeaChem demonstration biorefinery, aerial view October 2012.

Date	Event
July 29, 2005	Congress passes the Energy Policy Act of 2005, with the first Renewable Fuel Standard (RFS1). President George W. Bush signs it into law (PL 109-58) on **August 8, 2005**. RFS1 sets annual standards for production and use renewable fuels, growing to 7.5 billion gallons by 2012, with 250,000 gallons to come from cellulosic sources beginning in 2012. Ethanol production reaches 3.9 billion gallons by year's end 2005. Biodiesel production is 112 million gallons.
Sept. 7, 2006	EPA proposes rules for RFS1 and asks Oak Ridge National Laboratories to estimate the energy security benefits of reducing foreign oil imports. Ethanol production reaches 4.9 billion gallons by year's end 2006. Biodiesel production reaches 250 million gallons.
Feb. 16, 2007	Verenium – a merger of Celunol Corp. and Diversa Corp. – breaks ground on a demonstration cellulosic ethanol biorefinery, with a capacity of 1.4 million gallons per year. The facility is commissioned in May 2009 and is later purchased by BP Biofuels.
May 1, 2007	EPA finalizes regulations for RFS1 for 2007 and beyond. EPA estimates the RFS1 will reduce emissions of benzene by as much as 4 percent and carbon dioxide equivalent greenhouse gas emissions between 8.0 and 13.1 million metric tons.
Sept. 1, 2007	RFS1 program begins. Obligated parties must demonstrate compliance on an annual basis through retirement of Renewable Identification Numbers (RINs) associated with each gallon of renewable fuel.
Dec. 18, 2007	Congress passes the Energy Independence and Security Act of 2007, containing an updated Renewable Fuel Standard (RFS2). President George W. Bush signs it into law (PL 110-140) on **Dec. 19, 2007**. RFS2 sets annual standards for production and use of both conventional and advanced renewable fuels, with conventional biofuel to reach 15 billion gallons by 2015 and advanced biofuel to reach 21 billion gallons by 2022, for a combined 36 billion gallons. Conventional biofuel production reaches 6.5 billion gallons by year's end 2007. Biodiesel production reaches 450 million gallons.
May 26, 2009	EPA proposes rules for RFS2 for 2010 and beyond, including four separate standards for biomass-based diesel,

	cellulosic biofuel, advanced biofuel and conventional biofuel. EPA formulates a new lifecycle assessment (LCA) model and publishes preliminary estimates of greenhouse gas emissions from various feedstocks, production processes, discount rates and projection timelines. EPA commissions peer reviews of model.
Oct. 15, 2009	Coskata commissions its Lighthouse demonstration cellulosic ethanol biorefinery in Madison, Pa., with a capacity of 40,000 gallons per year. The demonstration runs for two years. Conventional biofuel production reaches 10.6 billion gallons by year's end 2009. Biodiesel production declines from 700 million gallons in 2008 to 545 million gallons in 2009, as industry awaits final rules for RFS and reauthorization of tax policies.
Jan. 29, 2010	DuPont Danisco Cellulosic Ethanol officially opens its demonstration cellulosic ethanol biorefinery in Vonore, Tenn., with a capacity of 250,000 gallons per year. The facility employs 40 people. Genera Energy – wholly owned by the University of Tennessee – supplies corn stover and switchgrass feedstocks to the facility, contracting with area farmers.
March 26, 2010	EPA publishes final regulations for the RFS2 for 2010 and beyond, setting the cellulosic standard at 6.5 million gallons for 2010 and combining the 2009 and 2010 standards for biomass-based diesel, keeping the two other s standards at statutory levels. EPA determines that biofuels made from a short list of approved cellulosic feedstocks comply with RFS greenhouse gas targets. The list includes: 1. Crop residues such as corn stover, wheat straw, rice straw, citrus residue; 2. Forest material including eligible forest thinnings and solid residue remaining from forest product production; 3. Secondary annual crops planted on existing crop land such as winter cover crops; 4. Separated food and yard waste including biogenic waste from food processing; 5. Perennial grasses including switchgrass and miscanthus.
May 6, 2010	Fiberight LLC commences production of cellulosic ethanol from municipal solid waste at a converted corn ethanol biorefinery in Blairstown, Iowa. When the second phase of construction is complete, the facility will produce 6 million gallons of cellulosic biofuel annually.
July 1, 2010	RFS2 regulations take effect. Obligated parties must now demonstrate compliance with all standards on an annual basis, with RFS1 RINs remaining valid.
Dec. 9, 2010	EPA finalizes the RFS2 standards for 2011, setting the cellulosic biofuel standard at 6.6 million gallons and

	keeping all other standards at statutory levels.
Dec. 21, 2010	EPA finalizes rules for Moderated Transaction System (EMTS) to track trading and retirement of RINs. Conventional biofuel production reaches 13.2 billion gallons by year's end 2010. Biodiesel production declines again to 315 million gallons.
Feb. 9, 2011	INEOS Bio New Planet Energy breaks ground in Vero Beach, Fla., on the Indian River BioEnergy Center, a commercial biorefinery that will produce eight million gallons of cellulosic ethanol and six megawatts of power when fully operational. The project creates 175 construction jobs and the operational biorefinery will employ 50 permanent workers. INEOS Bio has operated a pilot facility in Fayetteville, Ark., since 2003.
May 12, 2011	KiOR breaks ground on a commercial biorefinery in Columbus, Miss., to produce 11 million gallons of renewable crude from wood chips. KiOR began production at a demonstration facility in Pasadena, Texas, the first quarter of 2010.
Sept. 21, 2011	Abengoa Bioenergy finalizes permits and begins construction of a commercial cellulosic biorefinery in Hugoton, Kansas, which will produce 23 million gallons of cellulosic biofuel plus renewable electricity for the facility. The biorefinery will employ 65 people and create 250 construction jobs over two years. Abengoa contracts with local biomass producers and farmers to secure up to 315,000 lbs. of crop residue each year.
Jan. 5, 2012	EPA issues direct final rule determining that additional feedstocks and production methods meet the requirements for advanced and cellulosic biofuels: • Biodiesel, renewable diesel, naphtha and liquified petroleum gas from camelina qualify as advanced biofuel; • Ethanol, renewable diesel, and naphtha from energy cane, giant reed and napier grass qualify as cellulosic biofuel; • Renewable gasoline and blendstock from crop residue and cellulosic components of municipal solid waste in a facility that uses natural gas or biomass for heat and power qualify as cellulosic biofuel; • Esterified biodiesel qualifies as biomass based diesel and advanced biofuel. ZeaChem completes construction and begins operation of a demonstration cellulosic biorefinery in Boardman, Ore., producing intermediate chemicals acetic acid and ethyl acetate. By April, the company begins construction of a second phase to produce up to 250,000 gallons of cellulosic ethanol from acetic acid, expected to be completed in 2012. The demonstration biorefinery will employ 100 full-time workers and

	create 338 construction jobs. ZeaChem also contracts with Greenwood Resources and area farmers to supply coppiced willow trees from 7,000 acres surrounding the biorefinery.
Jan. 9, 2012	EPA finalizes 2012 RFS2 standards, setting the cellulosic standard at 8.65 million gallons.
March 5, 2012	EPA withdraws direct final rule issues on Jan. 9, due to adverse comments, and moves forward with proposed rule and additional comment period.
March 13, 2012	POET-DSM Advanced Biofuels breaks ground on a commercial biorefinery in Emmetsburg, Iowa, to produce 25 million gallons per year of cellulosic ethanol. The biorefinery will employ 40 full time workers and create 200 construction jobs. POET had previously completed the feedstock stackyard and worked with farmers for two years to begin harvesting and delivering corn stover to the facility. POET had also operated a pilot scale biorefinery in Scotland, S.D., since 2009.
August 9, 2012	INEOS New Planet BioEnergy receives Parts 79 and 80 registrations from the U.S. EPA for the production and sale of advanced bioethanol from non-food waste materials. The Indian River BioEnergy Center is the first large-scale project in the United States to receive registrations for a facility using non-food vegetative waste materials (vegetative and yard waste) to produce cellulosic ethanol. Construction on the Center was completed in June and the facility is scheduled to begin production of advanced bioethanol in the 3rd quarter of 2012.
October 31, 2012	INEOS New Planet BioEnergy facility in Florida begins producing renewable power.
November 8, 2012	KiOR Inc. announces start up of its commercial biorefinery in Columbus, Miss., producing renewable diesel and renewable gasoline. KiOR received Part 79 fuel registration from EPA for renewable gasoline and renewable diesel in July and August, respectively.
November 30, 2012	DuPont Cellulosic Biofuels breaks ground on a 30 million gallon per year cellulosic biofuel refinery in Nevada, Iowa, representing an investment of $200 million.

BRAZILIAN SUGARCANE INDUSTRY ASSOCIATION
ETHANOL • SUGAR • ELECTRICITY

May 23, 2013

VIA ELECTRONIC MAIL

Committee on Energy and Commerce
United States House of Representatives
Washington, DC 20515

Re: UNICA's Comments on "Renewable Fuel Standard Assessment White Paper: Greenhouse Gas Emissions and Other Environmental Impacts"

To Whom It May Concern:

The Brazilian Sugarcane Industry Association ("UNICA") appreciates the opportunity to provide these comments in response to the Committee on Energy and Commerce's *Renewable Fuel Standard Assessment White Paper: Greenhouse Gas Emissions and Other Environmental Impacts* ("*RFS White Paper*").

UNICA is the largest organization representing sugar, ethanol, and bioelectricity producers in Brazil. UNICA's members are responsible for more than 50% of all ethanol production in Brazil and 60% of overall sugar production. UNICA's priorities include serving as a source for credible scientific data about the competitiveness and sustainability of sugarcane biofuels. The association works to encourage the continuous advancement of sustainability throughout the sugarcane industry and to promote ethanol as a clean, reliable alternative to fossil fuels. Sugarcane ethanol production uses 0.5% of Brazil's total land and reduces greenhouse gas ("GHG") emissions by over 60%, compared to conventional gasoline, based on the U.S. Environmental Protection Agency ("EPA")'s methodology. And thanks to our innovative use of ethanol in transportation and biomass for power cogeneration, sugarcane is now a leading source of renewable energy in Brazil, representing about 15% of the country's total energy needs. The scope of the industry is expanding existing production of renewables and bioplastics and, with the help of innovative companies here in the United States and elsewhere, is beginning to offer bio-based hydrocarbons that can replace carbon-intensive fossil fuels.

The sugarcane ethanol produced by UNICA's members provides significant GHG emissions reductions when compared to a gasoline baseline, and we are proud of the role that Brazilian sugarcane has played thus far in achieving the objectives and mandates of the RFS program. As demonstrated by EPA's own lifecycle analysis, the GHG emissions reductions associated with Brazilian sugarcane ethanol exceed the emissions thresholds for all categories of advanced biofuels included in the RFS program. Thus, in order to maintain and expand upon these important GHG benefits, UNICA urges Congress and EPA to maintain their commitment to the RFS program and its increasing mandates for advanced biofuels, such as Brazilian sugarcane ethanol.

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In further response to the *RFS White Paper*, UNICA provides the following answer to the Committee's questions:

I. Is the RFS reducing greenhouse gas emissions below that of baseline petroleum-derived fuels? Is the RFS incentivizing the development of a new generation of lower greenhouse gas emitting fuels? Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?

Since Congress passed the Energy Independence and Security Act of 2007 ("EISA") and directed EPA to implement the RFS2 program, the RFS program has been responsible for significant reductions in GHG emissions below the petroleum-derived fuel baseline. One of the most significant provisions of the EISA was the creation of separate renewable fuel mandates for advanced biofuels, biomass-based diesel, and cellulosic biofuel, each of which offers superior GHG emission reduction benefits when compared to petroleum-derived fuels and corn ethanol alternatives. By creating a separate mandate for these renewable fuel products, the RFS program is boosting GHG emissions reductions and creating incentives for the development of new lower GHG emitting fuels that will qualify for these preferred renewable fuel categories. UNICA expects that the GHG emission reduction benefits of the RFS program will only continue to grow as the mandates for advanced biofuels increases each year.

UNICA is proud of the role that Brazilian sugarcane ethanol has played helping the United States to achieve its GHG emissions reduction goals under the RFS program. Sugarcane ethanol is the most efficient biofuel produced at a commercial scale and, as described below, can reduce GHG emissions by over 60% when compared to a fossil fuel baseline. Further, in response to programs such as the RFS, Brazilian sugarcane producers have made a long-term commitment to providing clean, renewable sugarcane ethanol to meet energy and environmental goals in Brazil and globally as evidenced by the considerable investments by major global energy companies, such as Shell, BP, Total and Petrobras, in the sugarcane industry. In fact, since the RFS2 program was instituted, Brazilian sugarcane ethanol producers have provided the vast majority of the undifferentiated advanced biofuels necessary to meet the RFS program's volume mandates.[1] UNICA expects that Brazilian sugarcane ethanol producers will continue to respond to the RFS program's increasing volume mandates by exporting greater volumes of ethanol to the United States in the coming years.

II. Could EPA's methodology for calculating lifecycle greenhouse gas emissions be improved, including its treatment of indirect land use changes? If so, how?

UNICA continues to support EPA's life cycle analysis ("LCA") for Brazilian sugarcane ethanol. LCAs from around the world have repeatedly shown that, when compared to the 2005 gasoline baseline, Brazilian sugarcane ethanol provides GHG benefits that equal or exceed the 60% emission reduction threshold for cellulosic biofuels.[2] These LCAs formed the basis for

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[1] Thus far, undifferentiated advanced biofuels such as Brazilian sugarcane ethanol have also been required to account for the share of cellulosic ethanol mandate that has been waived by EPA in yearly rulemakings in accordance with the EISA.

[2] *E.g.*, Wang. M. and M. Wu, "Life-cycle energy use and greenhouse gas emission implications of Brazilian sugarcane ethanol simulated with the GREET model." *International Sugar Journal* 110.1317 (2008): 527-45; Zuurbier, Peter and Jos Van de Vooren, eds. *Sugarcane Ethanol: Contributions to Climate Change Mitigation and the Environment*, (Wageningen, The Netherlands: Wageningen Academic, 2008); Macedo, I.C., Seabra, J., and J. Silva, "Greenhouse gases emissions in the production and use of ethanol from sugarcane in Brazil: The 2005/2006 averages and a prediction for 2020," *Biomass and Bioenergy*, 32.7 (2008): 585-95.

EPA's approval of Brazilian sugarcane ethanol as an advanced biofuel in the final RFS2 Rule. 75 Fed. Reg. 14,670 (Mar. 26, 2010). More recent studies published after the RFS2 Rule continue to support EPA's conclusions regarding the GHG benefits of sugarcane ethanol.[3]

EPA's development of an LCA for Brazilian sugarcane ethanol included significant stakeholder involvement. In its comments on the proposed RFS2 Rule, UNICA provided EPA with a detailed assessment of the lifecycle GHG emissions associated with Brazilian sugarcane ethanol. The data provided by UNICA showed that Brazilian sugarcane ethanol reduces GHG emissions by up to 90% when compared to fossil fuels.[4] UNICA also provided an extensive critique of EPA's assessment of the lifecycle GHG emissions of Brazilian sugarcane ethanol, which included detailed information regarding Brazil's agricultural and energy sectors and how they impact the lifecycle GHG benefits attributable to Brazilian sugarcane ethanol production.[5] In response to UNICA's comments, EPA adjusted its assessment of lifecycle GHG emissions for Brazilian sugarcane ethanol, concluding that such emissions were likely reduced by more than 60% as compared to the gasoline baseline. 75 Fed. Reg. at 14,790-91. As a result, Brazilian sugarcane ethanol qualifies as an advanced biofuel under the RFS2 program and total lifecycle GHG emissions reductions exceed the 60% threshold for cellulosic biofuels.

In light of this open and transparent rulemaking process that developed the LCA for Brazilian sugarcane ethanol and its consistency with more recently published LCAs, UNICA is confident that EPA's LCA continues to accurately reflect the GHG emission reduction benefits associated with Brazilian sugarcane ethanol. Moreover, because EPA's initial LCA addressed indirect land use change, there is no need for further adjustments on that basis.[6] As a result, no changes to EPA's LCA methodology are required for Brazilian sugarcane ethanol.

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[3] Seabra, J.E.A., Macedo, I.C., Chum, H.L., Faroni, C.E. and C.A. Sarto, "Life cycle assessment of Brazilian sugarcane products: GHG emissions and energy use," *Biofuels, Bioproducts, and Biorefining*, 5 (2011): 519–532. Khatiwada, D., Seabra, J., Silveira, S., and W. Arnaldo, 2012. "Accounting greenhouse gas emissions in the lifecycle of Brazilian sugarcane bioethanol: Methodological references in European and American regulations," *Energy Policy*, 47(C) (2012):384-397. Seabra, J.E.A. and I.C. Macedo, "Comparative analysis for power generation and ethanol production from sugarcane residual biomass in Brazil," *Energy Policy*, 39(1) (2011): 421-428. Souza S.P. and J.E.A. Seabra, "Environmental benefits of the integrated production of ethanol and biodiesel," *Applied Energy* (2012), *available at* http://dx.doi.org/10.1016/j.apenergy.2012.09.016. Paes L.A.D. and F.R. Marin, "Carbon storage in sugarcane fields of Brazilian South-Central region," *Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report*, (Piracicaba, São Paulo, 2011), *available at* http://www.unica.com.br/download.php?idSecao=17&id=16900437. Joaquim, A.C., Bertolani, F.C., Donzelli, J.L., and R.M. Boddey, "Organic Carbon Stocks in Soils Planted to Sugarcane in the Mid-South Region of Brazil: A Summary of CTC´s Data, 1990-2009," *Centro de Tecnologia Canavieira [Centre for Sugarcane Technology]. Technical Report*, (Piracicaba, São Paulo, 2011), *available at* http://www.unica.com.br/download.php?idSecao=17&id=18105453.

[4] *See, e.g.*, Zuurbier and Jos Van de Vooren (2008).

[5] *Id.* at 9-10, 16-34.

[6] Recent studies have confirmed EPA's assertion in the LCA that Brazilian sugarcane production would primarily displace existing pasture lands. *See*, *e.g.*, Lapola, D., Schaldach, R., Aclamo, J., Bondeau, A., Koch, J., Koelking, C., and J. Priess, "Indirect land-use changes can overcome carbon savings from biofuels in Brazil," *Proceedings of the National Academy of Science*, 107 (2010): 3388-3393. *See also* Adami, M., Freidrich, B., Rudorff, T., Freitas, R.M., Aguiar, D.A., Sugaware, L.M., and M.P. Mello, "Remote Sensing Time Series to Evaluate Direct Land Use Change of Recent Expanded Sugarcane Crop in Brazil*," Sustainability*, 4 (2012): 574-585. However, due to increase in efficiency and cattle density on

UNICA believes that EPA has the necessary authority to adjust the RFS to ensure that the desired GHG reduction is achieved. One example where EPA could act to improve the level of GHG reduction would be to phase out the grandfathering provision for conventional renewable fuels. Under EISA, all renewable fuels must meet the 20% GHG reduction criterion except those facilities that began construction prior to December 2007. EPA has ''grandfathered'' these facilities, exempting them from the 20% GHG reduction requirement but has not determined whether the grandfather clause would sunset in the future. UNICA believes that by requiring all renewable fuels to meet the minimum 20% GHG reduction, EPA would be sending a clear signal to the U.S. and global industry that additional GHG reduction is necessary. This could have the added benefit of encouraging some of the older facilities, which are currently benefiting from the "grandfather clause", to upgrade their processes to either produce lower carbon intensity ethanol or shift to drop-in renewable fuels that would be fungible with the existing motor vehicle infrastructure.

III. Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?

UNICA believes that the definition of renewable biomass is adequate to protect against unintended environmental consequences in Brazil. There is no dispute that Brazilian sugarcane ethanol meets the EISA's statutory definition of a renewable biomass feedstock, as it is a "planted crop" that has been "harvested from agricultural land" that was under cultivation prior to December 2007 and remains "actively managed." *See* 42 U.S.C. § 7545(o)(1)(I). At this time, sugarcane production uses only 1% of Brazil's territory and growth in sugarcane production has occurred primarily on pasture lands that have been maintained as agricultural land since well before 2007. Moreover, changes in production practices associated with the "Green Ethanol Protocol"[7] and other voluntary and regulatory programs in Brazil have reduced the environmental impacts associated with sugarcane production. As a result, the environmental impacts associated with Brazilian sugarcane ethanol production are even less than what was anticipated when the EIA was passed and the RFS2 regulations were implemented.

At the same time EPA's implementing regulations impose onerous requirements on foreign renewable fuel producers seeking to prove that their feedstocks meet the definition of renewable biomass. These regulations add significant costs and uncertainty for sugarcane ethanol producers and importers as well as the companies who purchase and ultimately retire the RINs generated by Brazilian sugarcane ethanol. To reduce the high transaction costs associated with establishing that Brazilian sugarcane qualifies as renewable biomass under the EISA, UNICA urges Congress and EPA to expand the aggregate compliance mechanism currently afforded to domestic renewable fuel producers. *See* 40 C.F.R. §§ 80.1454, 80.1457. By expanding the aggregate compliance mechanism to include Brazilian sugarcane, producers could demonstrate compliance with the definition of renewable biomass based on nationwide production, rather than requiring chain-of-custody recordkeeping for each sugarcane farm

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pasturelands, excess pasture land has been available to meet increased demand for Brazilian sugarcane ethanol.

[7] The "Green Ethanol Protocol" is a voluntary agreement signed between mills, sugarcane suppliers, and the State of São Paulo to end the practice of sugarcane field burning several years ahead of what is called for in existing legislation. Today 73% of the cane harvested in São Paulo state is mechanized. The Green Protocol also establishes benchmarks for water conservation, maintenance and recomposition of riverside vegetation.

supplying ethanol mills. By streamlining the recordkeeping and reporting requirements currently required by the RFS2 regulations, Congress and EPA can further incentivize the production of Brazilian sugarcane ethanol and increase the associated environmental benefits.

IV. What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels? Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?

When used in internal combustion engines, Brazilian sugarcane ethanol produces similar emissions to petroleum derived fuels. These emissions are subject to the same Clean Air Act requirements as emissions from petroleum-derived fuels, and there is no need for additional air quality regulations to address these emissions. Instead, any emissions associated with the combustion of sugarcane ethanol will be subject to the generally applicable EPA regulations and environmental safeguards that apply to all transportation fuels.

Further, because Brazilian sugarcane ethanol is a foreign product, the harvest and production processes are regulated by the Brazilian government rather than Congress and the EPA. To that end, air quality impacts associated with Brazilian sugarcane production and harvest are currently mitigated through governmental regulations and voluntary best practices. For example, the Green Ethanol Protocol has dramatically reduced reliance on sugarcane burning during harvest and, as a result, has dramatically reduced local air quality impacts in Brazil. As a result of these initiatives in Brazil, Congress can be assured that Brazilian sugarcane ethanol is not producing additional air quality impacts in the United States or in Brazil.

A study led by pathologist doctor Paulo Saldiva, from University of São Paulo[8], shows that the large-scale replacement of petroleum by sugarcane biofuels provides significant benefits for public health. This study indicated that more than 12,000 hospitalizations and 875 death would be avoided annually by replacing the gasoline and diesel in São Paulo's bus fleet with sugarcane biofuels. The study also found that the reduction of public and private expenditure on health would be about $190 million. Further, in addition to providing advantages related to the local environment, the production and use of sugarcane ethanol brings important social benefits such as employment generation and income, and public health around the world.

V. Has the implementation of the RFS revealed any environmental challenges or benefits not fully anticipated in the statute?

UNICA is unaware of any unanticipated challenges or benefits that were not fully anticipated by the EISA or by EPA when it issued the RFS2 regulations. In response to the slow development of commercial-scale cellulosic biofuel facilities EPA has conducted rulemakings each year that waive significant portions of the EISA's cellulosic ethanol mandate. However, that volume has been met with other advanced biofuels such as Brazilian sugarcane ethanol that offer comparable GHG emission reduction benefits. As a result, the GHG emission reduction benefits anticipated by the EISA have been achieved, even if through different paths.

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[8] Saldiva, P. *et al.*, O etanol e a saúde. In: Etanol e bioeletricidade: a cana-de-açúcar no futuro da matriz energética / [coordenação e organização Eduardo L. Leão de Souza e Isaias de Carvalho Macedo. -- São Paulo: Luc Projetos de Comunicação, 2010. p. 98-135.

Another recent development that may not have been anticipated by Congress or by EPA is the development of two-way ethanol trade between the United States and Brazil. This trade involves the import of an advanced biofuel—Brazilian sugarcane ethanol—into the United States, and the export of a conventional renewable fuel—corn ethanol[9]—to Brazil. Some have argued that this two-way trade is inefficient and should be stopped, presumably by increasing consumption of advanced biofuels in Brazil and by increasing consumption of corn ethanol in the United States. However, no matter how interesting it may be as an abstract policy matter, it would be inappropriate to attribute any unforeseen environmental challenges associated with two-way ethanol trade to the RFS program. First, the RFS program does contemplate the import of ethanol from Brazil and EPA expressly included emissions associated with the transport of Brazilian sugarcane ethanol when it completed its LCA. As a result, these emissions were fully anticipated by the statute and EPA's implementing regulations. Second, any environmental challenges associated with the export of corn ethanol to Brazil are completely unrelated to implementation of the RFS program and cannot be attributed to it. Instead, such challenges should be attributed to the market conditions that created them, namely excess supply of domestic corn ethanol and policies in Brazil that encourage the export of United States ethanol to Brazil. In sum, none of the unanticipated impacts associated with two-way ethanol trade can be attributed to the implementation of the RFS program.

VI. What is the optimal percentage of ethanol in gasoline? What is the optimal percentage of biomass-based diesel in diesel fuel?

As the largest representative organization of the Brazilian ethanol industry, UNICA's extensive experience with low, medium, and high ethanol content blends is highly relevant to the United States' consideration of higher ethanol blends, including, but not limited to E15. In fact, ethanol blends of up to 25% have been commonly used in Brazil for several years. Based on UNICA's experience, approval of higher ethanol blends under appropriate regulatory and technological circumstances can provide a feasible and cost efficient opportunity to produce real environmental benefits including GHG emissions reductions. At the same time, UNICA appreciates that the successful implementation of high ethanol content blends is the result of a century-long commitment to ethanol and to the development of the infrastructure needed to support it. As a result, there is no guarantee that Brazil's ethanol policy choices represent the optimal policies for the United States. Thus, although UNICA cannot offer a specific recommendation for the optimal percentage of ethanol in gasoline, we believe that the United States can successfully implement higher ethanol content blends and we offer our substantial expertise to Congress and to EPA in the event that they wish to pursue implementation of higher ethanol content blends

As for renewable diesel, UNICA has followed closely the experience of the United States and other companies developing renewable diesel from sugarcane and other feedstocks. For instance, California-based Amyris has been operating a plant in Brazil that converts sugarcane into a renewable diesel. Amyris renewable diesel is a drop-in replacement for petroleum-derived fuels compatible with existing diesel engines and fuel systems without modifications. In fact, following successful testing with engine and bus manufacturers such as Cummins and Mercedes-Benz, approximately 300 buses in the cities of São Paulo and Rio de Janeiro, Brazil,

[9] Under the EISA, "ethanol derived from corn starch" cannot qualify as an advanced biofuel. 42 U.S.C. §7545(o)(1)(B)(i).

have been running on 10-30% blends of Amyris renewable diesel for over a year already.[10] Based on this experience, we believe that there's clear evidence that renewable diesel, produced from sugarcane, may be able to play a growing role in powering diesel engines in the years to come. UNICA believes, however, the correct approach is to continue close engagement with engine manufactures and standard-stetting bodies before launching into a determination of what the "optimal" blend should be.

VII. What are the best options for substantially further reducing greenhouse gas emissions from the transportation sector? Is the RFS an important component of such effort?

UNICA believes that continued support for and development of advanced biofuels and other renewable fuels with significant GHG emissions reduction potential is the best option for reducing GHG emissions from the transportation sector. Thus a continued commitment to the aggressive and technology-forcing renewable fuel mandates included in EISA will be a critical component to any effort to reduce such emissions. The industry needs clear and stable rules in order to continue to attract investments that will bring lower emissions alternatives fuels into the market. UNICA's members have played a critical role in helping the United States achieve these aggressive mandates for advanced biofuels thus far. And UNICA and its members are committed to producing increasing quantities of Brazilian sugarcane ethanol to help ensure compliance with the RFS program's advanced biofuel mandate in the future. Thus we urge Congress and EPA to maintain its commitment to advanced biofuels, and to ensure that other transportation policies are consistent with the goals of the EISA and do not inadvertently serve as impediments to successfully achieving the EISA's advanced biofuels mandate.

Respectfully Submitted,

Leticia Phillips
Representative – North America

[10] Battistella, G. *et al.*, "Amyris's Cane Diesel in Brazil: Sugarcane is not for just ethanol anymore." In Informa Economics FNP *Renergy 2011*, 2011. p. 178-181

House E&C White Paper #3 - Environment

Questions for Stakeholder Comment with answers from Butamax™ Advanced Biofuels, LLC

1. Is the RFS reducing greenhouse gas emissions below that of baseline petroleum- derived fuels?

   Yes. While the RFS was structured primarily as a tool to improve domestic energy security through displacement of petroleum with (non-petroleum) renewable fuels, all of the qualifying renewable fuels are required to offer life-cycle greenhouse gas emission benefits relative to baseline petroleum-derived fuels. Since the implementation of RFS, the share of gasoline and diesel fuels which are qualifying renewable fuels has grown rapidly. As a result, life-cycle GHG emissions are significantly lower than they would have been if the composition of the US gasoline and diesel fuel mix remained unchanged. This is a clear benefit resulting from the RFS and its encouragement of biofuel development and production.

   Is the RFS incentivizing the development of a new generation of lower greenhouse gas emitting fuels?

   Yes. While Butamax's shareholders began its biobutanol program in 2003, (before the RFS), other companies were incentivized by the RFS to research and develop a new generation biofuels.

   Case in point, Advanced and Cellulosic volume mandates contained within the RFS2 have created a level of assurance around demand for these products which has resulted in a greatly accelerated flow of private investment into the sector. Initially, this investment was primarily for R&D, today it is increasingly directed for commercialization with several projects now in various stages of construction, start-up and commercial operation. Butamax expects to commence construction on the first phase of its first commercial-scale biobutanol installation later this year.

   Commercialization of advanced molecules, such as biobutanol, facilitate the timely achievement of this policy objective not only by offering a favorable lifecycle greenhouse gas balance but also by enabling the use of fuel formulations with high biofuels contents with existing vehicles and infrastructure. For example, gasoline containing 16% biobutanol is considered equivalent to gasoline containing 10% ethanol from a fuel specification perspective, but contains double the renewable energy of the E10 blend[1]. In the specific case of corn-derived biofuels, where EPA has found corn ethanol to be able to achieve a 20% GHG benefit and corn biobutanol to be able to achieve a 30% GHG benefit, the overall GHG benefits for corn biobutanol blended at 16% are approximately triple those achieved for corn ethanol blended at 10%.[2]

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1 $\frac{16vol\%*(95500/115600)}{[84vol\%+16vol\%*(95500/115600)]}=13.6\%$, where biobutanol energy content is 95,500 BTU/gal and gasoline energy content is 115,600 BTU/gal.

$\frac{10vol\%*(75700/115600)}{[90vol\%+10vol\%*(75700/115600)]}=6.8\%$, where ethanol energy content is 75,700 BTU/gal and gasoline energy content is 115,600 BTU/gal.

2 $\frac{16\%*\left(\frac{95500}{115600}\right)*30\%}{16\%*\left(\frac{95500}{115600}\right)+84\%}=4.1\%$ lifecycle greenhouse gas benefit for a 16% blend of corn biobutanol with 30% lifecycle greenhouse gas benefit and 84% baseline gasoline.

$\frac{10\%*\left(\frac{75700}{115600}\right)*20\%}{10\%*\left(\frac{75700}{115600}\right)+90\%}=1.4\%$ lifecycle greenhouse gas benefit for a 10% blend of corn ethanol with 20% lifecycle greenhouse gas benefit and 90% baseline gasoline.

Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?

Yes. Looking at the realization of existing statutory requirements from today forward to 2022, nearly all of the increases in the annual volumetric requirements are in the Advanced and Cellulosic categories, which are mandated to offer lifecycle greenhouse gas reductions of 50% and 60%, respectively. This means that petroleum-derived fuels will, increasingly, be displaced by growing volumes of very clean domestic U.S. fuels.

2. Could EPA's methodology for calculating lifecycle greenhouse gas emissions be improved, including its treatment of indirect land use changes? If so, how?

Prior to implementation of RFS2 requirements, lifecycle greenhouse gas analysis was generally used in a largely qualitative manner for ranking different options against each other. RFS2 was one of the first applications which required lifecycle greenhouse gas analysis to be used in a quantitative manner, for ranking renewable fuel pathways relative to a defined standard which had substantial economic and policy implications. This put tremendous pressure on EPA to develop appropriate tools in a timely manner. Quantitation of the impact of indirect land use change (ILUC) was particularly challenging as it was a rapidly emerging concept with material impacts on the overall lifecycle greenhouse gas analysis.

EPA responded to this substantial challenge in an appropriate manner through a series of consultations with a broad range of stakeholders. In the end, they had to make the choices required to formulate a model which enabled them to meet their statutory requirements for scoring renewable fuel pathways as needed to permit regulated parties to supply the market with fuel. Given this background, it is not surprising that most stakeholders can identify aspects of EPA's approach with which they disagree.

Going forward, the passage of time has enabled the state of knowledge on lifecycle greenhouse gas analysis to further advance, particularly in the area of ILUC. Also, the substantial growth of biofuels production and use since implementation of RFS2 has resulted in more real-world data being available for use in testing and refining the models which EPA employs. Accordingly, it would seem technically justifiable to require EPA to periodically re-evaluate its models with appropriate stakeholder consultations. As a change in models could have significant economic impact to existing investments it will be necessary for any model updates to be implemented in a thoughtful manner, one which is consistent with how other regulatory updates have been implemented in analogous circumstances and which ensures investor and business certainty.

3. Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?

Yes, the RFS's definition of biomass is adequate and the law itself does not require a substantial re-write to address these issues. The EPA may wish to examine this subject and determine if any adverse consequences are occurring – however the Agency should do so in a manner that does not interject undue uncertainty into the marketplace and disrupt investment. Butamax believes that in formulating the current definition of renewable biomass, the Congress sought to strike a balance between maximizing the number of feedstock options so as to enable the greatest feasible diversity of supply options for an unknown mix of to-be-developed technologies while assuring sustainability through limiting use of feedstock sources which were not truly renewable or which had other important uses.

While other alternative fuels, such as natural gas and electricity can offer significant energy *security and environmental benefits, the RFS was deliberately designed to focus on biofuels as a source of secure low carbon energy which can be used with existing vehicles and infrastructure. Compatibility with existing vehicles and infrastructure is key to accelerate the pace at which the environmental and energy security benefits can be realized.*

Biobutanol is well suited for meeting all of these objectives not only because of its high level of compatibility with existing vehicles and infrastructure but also because of its high similarity with gasoline and its ability to be produced at existing and future biofuel facilities operating on a very wide range of biomass feedstocks.

4. What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels?

The non-greenhouse gas impacts of the biofuels specified by the RFS can best be considered through examination of key portions of the lifecycle – biomass production, biofuel manufacture, transportation and end-use.

- <u>Biomass Production</u> – While the use of waste-based feedstocks for biofuels has important benefits and will have a place in the market, Butamax believes that the largest share of biofuel production will come from purpose-grown crops. Broadly, this activity in the biofuels arena is analogous to the role of exploration and production activities for petroleum-derived fuels. While specifics of biofuels and petroleum can be quite different, both options must consider water use, land use and prevention of air, soil and water pollution. EPA, along with other Federal and state agencies, has substantial existing authority over the prevention of air, soil and water pollution connected to both biomass and petroleum production.

- <u>Biofuel Manufacture</u> – In a general sense, there is a strong degree of similarity between the production of biofuels from biomass and the refining of petroleum to gasoline and diesel. Existing environmental regulation of both these activities by EPA as well as state and local agencies is quite similar so the net impact to surrounding communities is already protected to a similar degree.

- <u>Transportation</u> – Overall, biofuels and petroleum fuels use the same transport modes – truck, rail, pipeline and vessel but the mix varies significantly with biofuels which most commonly are shipped via rail while petroleum fuels are most commonly moved via pipeline. As a general principle, pipelines are the preferred transport mode for fuel in terms of both energy efficiency (greenhouse gas emissions) and safety (prevention of air, soil and water pollution). However, it is important to note that certain new biofuels, such as biobutanol can be moved safely and efficiently by means of pipeline transport. Also, biobutanol's higher energy density means that less transportation resource and risk is required for each unit of energy delivered to the market. It should be noted that domestically produced biofuels displace petroleum fuels, where the marginal supply comes from long distance imports, and so there is a significant benefit from biofuels in this respect.

- <u>End-use</u> – The effects of fuel composition on both tailpipe and evaporative emission of criteria pollutants from gasoline vehicles are well-understood with extensive coverage in the technical literature. EPA's complex model for predicting the emission characteristics of reformulated gasoline was built off of this knowledge base. New fuel formulations, including new biofuels or existing biofuels blended at higher levels are required to be registered with EPA before they can be brought to market. Achieving EPA registration requires submission of health effects data generated by well-defined protocols which demonstrate that the requested formulation does not

create any significant adverse health consequences relative to baseline gasoline. Accordingly, material adverse impacts on the environment are avoided.

Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?

No. As discussed above, all the potential adverse air quality impacts which might be caused by RFS are already controlled under existing EPA regulation.

5. Has implementation of the RFS revealed any environmental challenges or benefits not fully anticipated in the statute?

   The RFS was deliberately written to be performance-oriented, not specifying feedstocks or fuels. This was a forward looking choice in many ways as it has encouraged innovation in what was a relatively new field at the time. However, it also needs to be recognized that fuels, refueling infrastructure and vehicles must be consistent for the targets to be achieved. Unfortunately, considerable resource has been expended in bringing more types of ethanol to the market without recognizing the limitations of the existing vehicle fleet or setting a direction for new vehicle capabilities. As there is a very long lead time to bring new vehicle technologies into the market at penetrations which materially impact fuel demand, advanced molecules such as biobutanol offer substantial value in enabling growth in biofuels demand at a pace consistent with the legislated supply volumes. Also, consumer demand and ease of use must be fully taken into account. If consumers do not like or trust a fuel or such fuel is not easily available, they will choose not to use it.

   In this environment, biobutanol and other drop-in fuels, which can be used with existing vehicles and infrastructure, need to take a key role to enable biofuels usage to grow more rapidly than the vehicle fleet can turn over.

6. What is the optimal percentage of ethanol in gasoline?

   Butamax sees a fundamental problem with the question as posed, -- as it is based on the premise that ethanol is the preferred renewable fuel for use in gasoline.

   Ethanol is a valuable portion of the US fuel mix today. It helps to lower gasoline prices while displacing substantial volumes of crude imports and materially reducing greenhouse gas emissions associated with the use of automobiles. The individuals and firms who built the ethanol industry have overcome many challenges, demonstrated the feasibility of delivering material volumes of biofuels and catalyzed creation of the substantial infrastructure necessary to safely and reliably bring their product to market. Continued use of E10, now nearly universal in the US market, augmented by growing use of E85 in flexible fuel vehicles offers substantial growing opportunity to deliver the benefits of biofuels with the existing vehicle fleet. RIN prices enable E85 to be profitably retailed at prices which offer good value to FFV owners. However, while market prices can change quickly, consumer behavior does not always do so. Thus, we find the US market presently in a transitional state as it seeks to incorporate growing volumes of ethanol into the fuel mix.

   But the benefits attributable to ethanol are not actually intrinsic to the chemistry of the ethanol molecule; they are derived from economically producing fuel from renewable feedstocks.

Advances in biotechnology now enable the same feedstocks and production assets to manufacture of other molecules, such as biobutanol, which deliver the benefits of ethanol and more. Biobutanol is an important example of what is now achievable without relying solely on changing the behavior of FFV owners or deployment of new vehicles.

Biobutanol's low oxygen content and closer chemical similarity to gasoline enable it to be blended at higher percentages in gasoline while retaining compatibility for use in existing vehicles and infrastructure. Its increased energy content means that a given volume of biobutanol displaces more petroleum than the same volume of ethanol. Specifically, a 16% blend of biobutanol in gasoline will displace the same amount of petroleum (and earn the same number of RINs) as would a 20% ethanol blend, yet biobutanol is suitable for use in all existing vehicles. It also offers consumers the same fuel economy as they obtain with E10. As biobutanol's vapor pressure is lower than that of gasoline, it does not require an RVP waiver (thereby reducing evaporative emissions) and it lowers the refiner's cost for production of on-spec gasoline. Its low water solubility means that biobutanol-gasoline blends can be transported via pipeline.

What is the optimal percentage of biomass-based diesel in diesel fuel?

Butamax does not expect biobutanol to be used in the biomass-based diesel market and therefore believes others can better answer this question.

7. What are the best options for substantially further reducing greenhouse gas emissions from the transportation sector?

The three primary tenets for reducing greenhouse gas emissions from transportation are to (1) reduce unnecessary use of transportation; (2) make transportation more energy-efficient and (3) maximize use of low greenhouse gas fuels.

Of these three tenets, automakers are making a substantial contribution to the second, through improved fuel economy, and biofuels are an important driver to the third. The contribution of biofuels increases as blend volumes increase and as the share of biofuels with a higher greenhouse gas reduction increases. The fact that biobutanol has a high energy density and can be used at higher blend percentages with existing vehicles and infrastructure makes it a particularly valuable tool in reducing greenhouse gas emissions without the need to wait for substantial turnover of the existing vehicle fleet.

Is the RFS an important component of such efforts?

Absolutely. Material change in the vehicle fuel mix requires long range planning on the part of biofuel producers, petroleum refiners, auto manufacturers, retailers and other stakeholders. RFS sends a very powerful signal to all of these stakeholders to drive the necessary multi-year changes required to make this transition possible. The RFS also gives all these stakeholders an important amount of regulatory certainty. Further, RFS provides evidence of demand which lenders and investors require to provide the capital necessary for building the necessary large volume of biofuel production capacity. In the absence of RFS, the demise of the RFS, or substantial change to the RFS, short term cycles in biofuel and petroleum fuel economics will tend to discourage or eliminate key research and investment in the biofuels sector which would *have a negative impact on long term domestic energy security and a deleterious impact global warming issues.*

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May 24, 2013

TO: House Energy and Commerce Committee

FROM: Chemtex Global

RE: Renewable Fuel Standard Assessment White Paper – Greenhouse Gas Emissions and Other Environmental Impacts

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These comments contain Chemtex Global's responses to several questions listed at the end of the House Energy and Commerce Committee's White Paper on the Renewable Fuel Standard's ("RFS") impact on greenhouse gas emissions and other aspects of the environment. Chemtex applauds the Committee for conducting this important study on the RFS and appreciates the opportunity to provide these comments.

Below are answers to the Committee's questions that are applicable to Chemtex. It is worth beginning the discussion, however, with an overview of the principles that guide Chemtex's approach. First, the development of biofuels requires competitive pricing compared to petroleum products *without subsidies.* Second, it requires environmental sustainability with respect to greenhouse gases ("GHG"), *i.e.*, an overall GHG sequestration balance (including biomass feedstock farming, transportation, chemicals or biofuels production processes). Third, it requires long-term agronomic sustainability in a manner that is not competitive with food. Fourth, it must be profitable for farmers to grow biomass feedstock.

1. *Is the RFS reducing greenhouse gas emissions below that of baseline petroleum-derived fuels? Is the RFS incentivizing the development of a new generation of lower greenhouse gas emitting fuels? Will the RFS produce further greenhouse gas emissions reductions when it is fully implemented?*

The RFS is incentivizing the production of cellulosic ethanol due to the high value renewable identification number ("RIN") attributed to the lower greenhouse gas emitting fuel. Companies such as Chemtex have invested significant amounts of money into the research and development of a means to produce cellulosic ethanol. However, as Chemtex has learned through the process, cellulosic ethanol will only displace petroleum-based fuels if it is cost-competitive with such fuels. Although the RFS contains many mandates, it does not include a mandate for consumers to purchase anything. Regardless of the high RIN value, cellulosic ethanol will never become the next generation fuel unless it is economically attractive to consumers.

After more than seven years of research and development activities, Chemtex has developed a technology that can produce simple sugars from cellulosic feedstocks for fermentation to bio-chemicals or cellulosic ethanol. Land and technology are readily available to allow the development of an alternative to fossil fuels without an impact on food- related feedstocks. Biofuels produced from the fermentation of simple sugars derived from non-food related and geographically sustainable biomasses that can displace commercial grade fossil fuels (gasoline, diesel, etc.) are an achievable target. In fact, at the present time, Chemtex and its parent company, Gruppo Mossi & Ghisolfi ("M&G") have a facility in Crescentino, Italy that is producing cellulosic ethanol on a commercial basis. Chemtex is eager to harness this technology in the United States, and has already received a loan guarantee from the Department of Agriculture ("USDA") to develop a commercial scale cellulosic ethanol facility in North Carolina.

Chemtex has the ability to produce advanced biofuels, including cellulosic ethanol, at prices which compete with gasoline or corn-based ethanol, provided the costs of the feedstocks from which these sugars are derived are reasonable. Specifically, Chemtex has concluded that to produce these fuels at such prices, the sugars must be derived from feedstocks that produce a minimum of 15 tons of dry biomass per acre. Feedstocks that yield this type of volume are not only desirable from an economic perspective, but from an environmental one as well; they substantially reduce the carbon footprint of the fuels produced.

The three approved pathways for purpose-grown crops under the RFS cannot produce enough dry biomass per acre to meet cost targets for the farmer or the biorefinery. Viable real world supply chains require a combination of locally grown and opportunistically available biomass. However, for the aggregate price to be such that the ethanol is cost competitive *without subsidy*, the producer must be able to insert a very high yielding biomass crop as the cornerstone of the supply chain.

Chemtex has identified a perennial plant called Arundo donax, which can yield as much as 28 dry tons of biomass per acre per year, to be such a cornerstone. This exact situation is coming to fruition in Europe where Chemtex's facility is subsidizing the cost of running locally available wheat and rice straw residuals—too expensive for consumption on their own—with purpose grown Arundo donax from the same agricultural community. Arundo makes the other crops economically viable.

Under current law, Chemtex cannot begin to produce cellulosic ethanol for consumption in the United States because the largest component of its supply chain —Arundo—is not a feedstock for which a "pathway" has been approved. As a practical matter, this means the cellulosic ethanol that Chemtex produces would not permit the company to generate RINs. The fuel would be of limited utility to obligated parties because they cannot use such ethanol to demonstrate compliance with the RFS.

It is Chemtex's belief—attested to by the nation's experience (or lack thereof) with cellulosic ethanol since the RFS was enacted—that the feedstocks presently approved for pathways under the RFS cannot meet cost targets for unsubsidized ethanol, much less be cultivated in the majority of the United States. Until that situation is changed, the promise of cellulosic biofuels as an effective alternative to fuels currently in the market will remain unfulfilled in the United States while the rest of the world advances.

The Environmental Protection Agency ("EPA") issued a direct final rule on January 5, 2012 approving pathways for several feedstocks, including Arundo,[1] but withdrew the rule after it received adverse comments from several environmental groups. The comments criticizing Arundo alleged that it is an "invasive species," *i.e.*, the plant could trigger unintended consequences by out-competing native species for limited resources (such as light, nutrients, water, space to grow, etc.). After 12 months of investigation and compromise, the USDA, the EPA and the Department of Interior agreed upon a path forward. The agencies submitted a proposed rule to the Office of Management and Budget ("OMB") under which Arundo would qualify as a pathway *provided* it was cultivated in a manner consistent with the best management safeguards that environmentalist were requesting.

To date, the Administration has refused to classify Arundo donax as renewable biomass under the RFS; the rule remains "stuck" at OMB. As it now stands, ethanol derived from the feedstock will not generate RINs and thus will not produce cellulosic ethanol in the United States nor will such ethanol be shipped to the United States. The commercial production of cellulosic ethanol is only illusory because the approved pathways are too limited. If the country expects to meet the requirements of the RFS, producers need feedstock pathways approved for the highest yielding crops that can be grown in a variety of soils and climates which exist in various regions throughout the United States.

Chemtex has spent more than two years attempting to work with the relevant agencies to facilitate the approval of the highest yielding biomass crops so they can be utilized in US supply chains. The State of North Carolina undertook an eight month evaluation of this topic, engaged stakeholders (including environmental groups), and provided a path forward for Arundo cultivation in North Carolina. However, the progress in North Carolina and with the EPA and the Department of Interior remains at a standstill.

Unless the situation changes rapidly, Chemtex will have no choice but to invest its resources outside the United States. Chemtex is prepared to step away from the loan guarantee it received from USDA if the approved feedstock pathways continue to be unattractive to both the farmer and the biorefineries. This is a loss for the US farmer, the US biofuel industry and the United States as a whole.

3. ***Is the definition of renewable biomass adequate to protect against unintended environmental consequences? If not, how should it be modified?***

Chemtex believes that the current definition of renewable biomass is adequate to protect against unintended environmental consequences because it provides EPA the flexibility to ensure that those feedstocks which are potentially invasive (or otherwise problematic) are cultivated in a responsible manner *as a legal prerequisite* to the resulting product qualifying for a RIN. However, Chemtex is frustrated that the flexibility granted through the statutory definition is not being utilized as EPA and the Administration consider the application for the pathway for Arundo donax.

[1] 77 Fed. Reg. 700 (Jan. 5, 2012).

Chemtex has not encountered anyone who doubts Arundo's capacity to generate cellulosic ethanol. Chemtex understands there are parties concerned about the safe and proper harvesting of the crop. The solution to this is to have EPA *mandate* cultivation of any potential biomass in a manner that meets a standard of care no less stringent than that established by the state of North Carolina *in order* for the resulting product to qualify for a RIN. In other words, EPA should require in its final rule that in order for Arundo donax to qualify as a pathway, it must be grown and cultivated in a manner that meets the state of North Carolina's minimum standards of care. This is the approach recommended by the only study that examined Arundo in multiple (riparian *and* non-riparian) environments.[2]

4. ***<u>What are the non-greenhouse gas impacts of the RFS on the environment relative to a comparable volume of petroleum-derived fuels? Is there evidence of a need for air quality regulations to mitigate any adverse impacts of the RFS?</u>***

To date, cellulosic ethanol is not available in the market at a cost that is competitive with petroleum-based fuels. Therefore, the predominant renewable fuel used to meet RFS requirements is derived from corn. There are significant non-greenhouse gas impacts generated by the use of corn to fuel the transportation fleet.

In addition, because the highest-yielding feedstocks have not yet been approved by the EPA for pathways under the RFS, environmental groups have raised concerns regarding the land-use associated with biomass feedstock growth. The crops approved for pathways for the advanced biofuel category today require significantly more acreage to produce the equivalent amount of fuel than Arundo donax could generate using less land. However, while the land-use concerns are mitigated by the use of a high-yield biomass crop, Chemtex appreciates concerns about the unintended consequences that could arise if the RFS incentivizes irresponsible cultivation of high-yield crops. Therefore, Chemtex has gone to great lengths to develop best practices in conjunction with the state of North Carolina, and contractually obligates its farmers to abide by them.

To the extent there is a need to promulgate regulations to mitigate any adverse impacts of the RFS, EPA should require potentially invasive cellulosic feedstocks to be cultivated pursuant to a minimum standard of care as a prerequisite to such feedstocks qualifying for a RIN. EPA was apparently prepared to issue such a rule for Arundo in February, but the final rule (proposed on March 5, 2013) did not include Arundo among the list of new RFS pathways.[3] Arundo remains "stuck" at OMB.

There is a fear that Arundo's risk of invasiveness is too great to justify its qualification as a pathway under the RFS. Arundo does pose a risk of invasiveness **if** it is planted in a riparian area. The literature and experience on this matter is clear. However, it is equally clear that **Arundo poses a minimal risk of invasiveness when it is planted in non- riparian areas in accordance with guidelines established by the State of North Carolina. The RFS is not so rigid as to prohibit feedstock utilization in *all* environments when such utilization only poses serious concerns in *some* environments. Instead, the RFS affords EPA the flexibility to limit a**

[2] John Virtue *et al.*, <u>Weed Risk Management Guidelines for *Arundo donax* Plantations in Australia</u> *in* <u>Commercial Potential of Giant Reed for Pulp, Paper and Biofuel Production</u>, 42-69 (Dec. 2010).

[3] 78 Fed. Reg. 14193 (Mar. 5, 2013).

feedstock's cultivation to certain areas and under certain conditions. The state of North Carolina has determined that Arundo donax does not pose a serious concern at Chemtex's North Carolina location, and Chemtex has the ability to responsibly produce cellulosic ethanol there. **The only thing stopping Chemtex from proceeding is the Office of Management and Budget.**

The most respected academics in the field agree with these conclusions. Professor David Bransby of Auburn University summarized his 14 years' experience growing Arundo by saying:

> *It is true that [Arundo donax] has colonized riparian areas along the Rio Grande and Southern California. However, this is due to the total lack of management, and the fact that these watersheds are* very *different from those in the eastern United States. In particular, they are essentially in desert regions where the native vegetation is not competitive, and the rivers in question flood for a few months each year, seriously excavating their banks, and then subside to no more than a trickle for the rest of the year. . . . In contrast, our rivers in the eastern United States are perennial, with a steady flow of water year-round, and are lined with highly competitive woody vegetation. Therefore, even though [Arundo donax] has been widely grown . . . in the eastern United States for well over a century, there is absolutely no evidence at all of it becoming invasive in this region.*[4]

Professor Barry Flinn, from the Institute for Sustainable and Renewable Resources at Virginia Tech University, is currently studying Arundo and agreed that "concerns expressed about invasiveness, while relevant for riparian zones, are over stated for other sites." Summarizing his literature review of Arundo's invasiveness, Professor Flinn said:

> *Arundo donax shows a widely reported lack of seed and seedling production. . . . Hence, inability to produce seeds represents a significant inhibitory mechanism to plant dispersion, and is not a contributing factor to the spread of the plant in the natural habitat. This is a positive trait for [Arundo donax], unlike other described weedy invasives. In a study of Arundo donax spreading inside and outside of flood zones, [one scholar] indicated that movement via fragmentation, rhizomes and layering occurred in the flood zone. However, it was also noted that in drier sites outside the flood zone, Arundo spreading was less dynamic, with slow expansion and similar stand appearances from year to year. These results further suggest that the invasive characteristic is dependent on site, and if careful selections*

[4] Dr. David I. Bransby, Ph.D., Professor, Energy Crops and Bioenergy, Auburn Univ. (Nov. 20, 2012) (emphasis in original).

are made to avoid riparian zones, and sites are managed, invasiveness can be avoided.[5]

Finally, Jacob Barney, Professor of Invasive Plant Ecology at Virginia Tech, agrees with his colleague Dr. Flinn. In summarizing his views on Arundo's invasiveness, Professor Barney—whose work was cited in a letter from scientists concerned about Arundo's purported invasiveness—said:

> *[W]hile I fully recognize the dramatic Arundo invasions in California and Texas, and the consequences on native species and ecosystem properties, it should not be assumed that Arundo will become invasive in all circumstances and locations. Nearly all research on Arundo has been conducted in California and Texas. . . . The intentional planting of Arundo along riparian corridors was also likely its downfall, which should not be the case for bioenergy predication.*[6]

Chemtex contractually requires its farmers to minimize this already small risk of invasiveness by following North Carolina best management practices. Farmers may not grow or transport Arundo near a river or stream; they must field-chop the plant, thereby rendering everything that is *removed* from the field *non-viable* (this is the opposite of what occurred in California, where Arundo—including cane and rhizomes—was *bulldozed* into the rivers). Utilizing a direct field chop harvest, the soil is never disturbed more than once every ten-twenty years for replanting, and reeds are shredded to eliminate viability. Arundo will be harvested one foot above the ground, to minimize tire damage as well as to ascertain that the rhizomes stay safely embedded in the soil to be the source of the next year's crop and the following ten to twenty years' crop.

The N.C. Best Practices mandates harvesting methods that "eliminate or reduce viable propagules" and "reduce propagule dispersal and establishment." Toward that end, Chemtex will abide by the guidelines contained in that document to minimize escape, including:

- All planting, harvesting, and transport vehicles will be cleaned of all plant material prior to moving off site;
- If viable seeds are produced, harvesting/baling methods (such as wrapping bales) will be used to reduce propagule spread;
- If stem fragments are known propagule sources, harvest practices will reduce/eliminate propagule viability, *e.g.*, shredding above-ground material to kill stem buds;
- Human access to the field will be controlled; and
- Field boundaries, buffer areas, and adjacent areas will be inspected regularly for propagules/seedlings.

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[5] Dr. Barry Flinn, Ph.D., Director, Inst. for Sustainable and Renewable Resources, Institute for Advanced Learning and Research, Danville, VA (Feb. 11, 2012).

[6] Dr. Jacob Barney, Ph.D., Assistant Professor of Invasive Plant Ecology, Dep't of Plant Pathology, Physiology and Weed Science, Virginia Tech Univ. (Feb. 12, 2012.)

Further, Chemtex complies with the U.S. Forest Service eradication protocol for Arundo, which has been shown to be 100% effective.[7] In fact, Chemtex goes beyond this protocol: When plants are no longer a productive source of biomass, Chemtex will remove the rhizomes from the field and dispose of them properly.

All of these actions are taken despite the fact that the Arundo's risk of invasiveness when harvested in a non-riparian area is already minimal.

The N.C. Best Practices require mitigation strategies and plans to minimize escape and other risks. Despite the already small risk of invasiveness, Chemtex will go above-and-beyond these strategies to ensure the crop does not spread. Annual inspections of growers will be performed in cultivated stands while native stands of Arundo will be documented. Signs of spreading will be sought outside of the fields in adjacent waterways and byways to and from the biorefinery. Any sign of spread will be documented and eradicated.

Chemtex was required by the N.C. Best Practices to ensure not only that the *region* (*i.e.*, eastern North Carolina) is suitable to Arundo donax, but the specific site (*i.e.*, the farmland near the proposed biorefinery location) as well. Thus, the N.C. Best Practices required Chemtex to choose a site wherein the production field "not be located directly adjacent to major dispersal corridors, such as streams, irrigation canals, major roads, or utility right of ways." In addition, storage sites are required to be "placed in locations not adjacent to sensitive habitats."

Chemtex believes that if the EPA were to require the adoption of the N.C. Best Practices as a prerequisite to the approval of a pathway for Arundo donax, all concerns about the environmental impacts of the high-yield crop would be addressed.

Again, Chemtex appreciates the opportunity to provide these comments and looks forward to working with the Committee as its White Paper process continues.

Respectfully submitted,

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Counsel

[7] An investigation to test the effectiveness of glyphosate for control of Arundo was conducted in southern California by Caltrans, the state transportation agency. Results indicate that cut-stem treatments, regardless of time of application (May, July, or September), provided 100% control with no resprouting. *See* http://www.fs.fed.us/database/feis/plants/graminoid/arudon/all.html#MANAGEMENT.